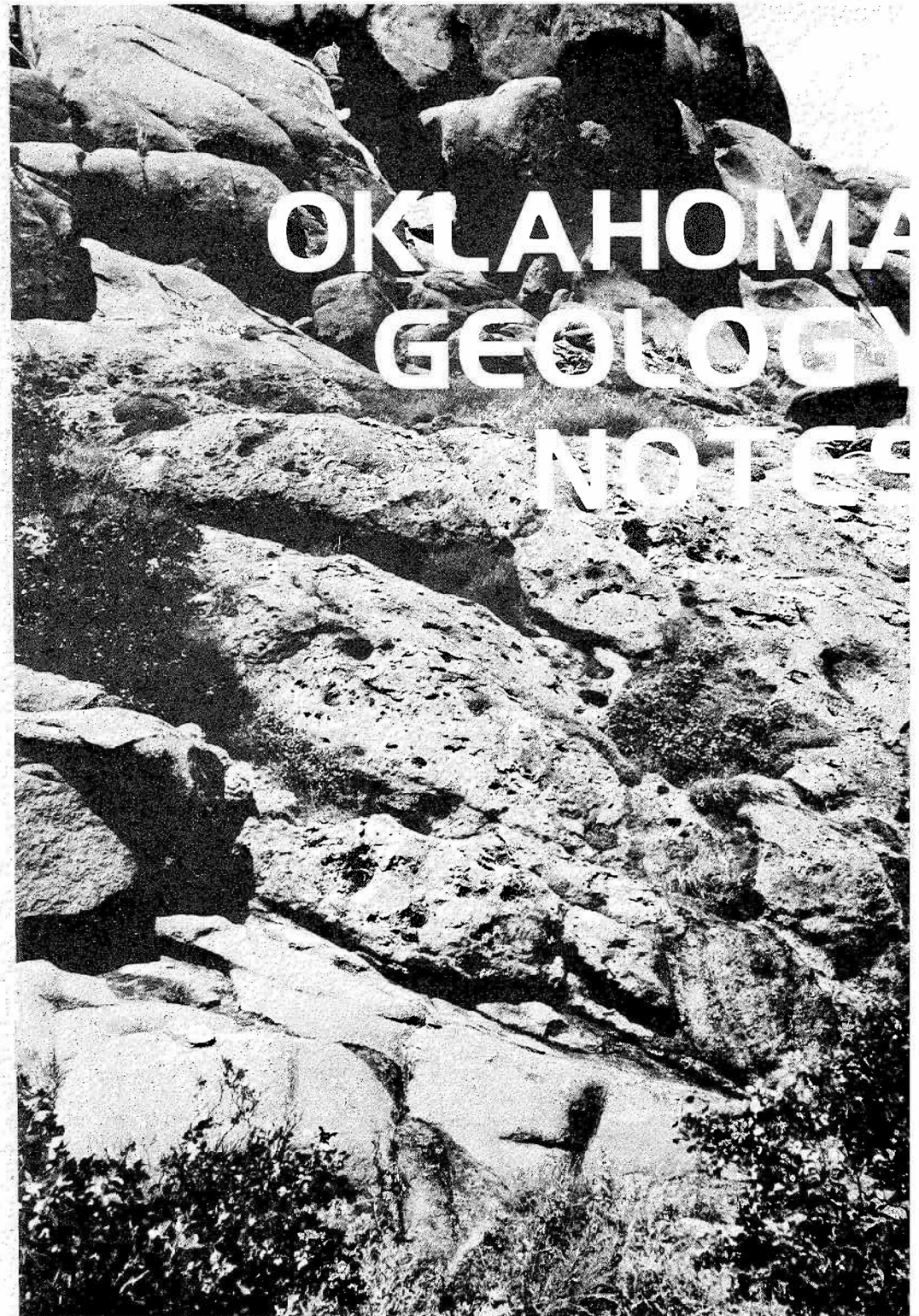
VOLUME 38 NUMBER 6 DECEMBER 1



OKLAHOMA GEOLOGY NOTES

Cover Picture

GRANITE-GRANITE CONTACT RELATIONS WICHITA MOUNTAINS

Many of the granite contacts in the Wichitas exhibit interesting features. The Lugert-Reformatory contact in Quartz Mountain State Park provides an example that is easily accessible for detailed study. That part of the contact in the NW¼NE¼SW¼ sec. 22, T. 5 N., R. 20 W. (near the southernmost extent of the Reformatory Granite, *Cr*, as shown in the cover photo of the *Notes*, 1978, v. 38, no. 1), when followed in the field, shows earlier phases of the younger Lugert engulfing blocks of Reformatory.

However, the point of the present photo is to document an unusually excellent example of a surge of late-crystallizing Lugert intruding earlier Lugert. Note the mass of pitted rock extending across the center of the view. Overall crystallization in the main magma chamber had progressed to the point where solubility of volatiles (probably mostly H_2O) was exceeded. This late surge was thus vapor rich. That vapor was present in this tongue is evidenced by the numerous miarolitic cavities and pockets. The upper and lower margins of this mass can clearly be discerned.

In the lower left corner of the photo, one of the rounded inclusions (about 0.3 m in length) common to the Lugert stands up in relief. Its long dimension is roughly parallel to the regional Reformatory-Lugert contact, which is several tens of meters away, indicating orientation by magmatic flow. Merritt (1958, OGS Bulletin 76) has interpreted these xenoliths as sedimentary, but some may be older igneous fragments.

—M. C. Gilbert

Editorial staff: William D. Rose, Elizabeth A. Ham, Judy A. Russell

Oklahoma Geology Notes is published bimonthly by the Oklahoma Geological Survey. It contains short technical articles, mineral-industry and petroleum news and statistics, an annual bibliography of Oklahoma geology, reviews, and announcements of general pertinence to Oklahoma geology. Single copies, seventy-five cents; yearly subscription, $4.00. All subscription orders should be sent to the address on the front cover.

Short articles on aspects of Oklahoma geology are welcome from contributors. A set of guidelines will be forwarded on request.

This publication, printed by The University of Oklahoma Printing Services, Norman, Oklahoma, is issued by the Oklahoma Geological Survey as authorized by Title 70, Oklahoma Statutes 1971, Section 3310, and Title 74, Oklahoma Statutes 1971, Sections 231-238. 1,500 copies have been prepared for distribution at a cost to the taxpayers of the State of Oklahoma of $1,888.00.

OKLAHOMA GEOLOGICAL SURVEY
ANNUAL REPORT

July 1, 1977–June 30, 1978

Introduction

For 69 years, the Oklahoma Geological Survey has served Oklahoma in its constitutionally assigned role of investigating, reporting, and assisting the public on matters pertaining to the State's natural resources. From its beginning on July 25, 1908, through the present fiscal year, the Survey has conducted geologic, mineral, and water-resources investigations in all parts of the State. Most of these investigations have been reported in the 124 bulletins, 78 circulars, 35 mineral reports, 18 geologic maps, 18 guidebooks, 6 hydrologic atlases, more than 25 miscellaneous publications, and 37 volumes of the periodical *Oklahoma Geology Notes* and its predecessor, *The Hopper*. Moreover, scores of publications by Survey staff members have been released through the journals of professional and scientific societies as well as through other State and federal cooperating agencies. Likewise, staff members have made hundreds of scientific and technical presentations to State, national, and international organizations concerning various aspects of the professional activities of the Survey. Thus, throughout its 69-year history, the Survey has conducted a program of natural-resources investigations that has contributed importantly to the State's position as a leading producer of mineral and energy resources.

The production of mineral and energy resources continues to be the greatest factor in Oklahoma's economy. In 1977, the value of mineral production exceeded $3.5 billion. This represented a 25-percent increase over 1976. Again, mineral fuels accounted for 96 percent of the value. Thus petroleum and natural gas continue to be the principal sources of mineral wealth in the State.

Energy Programs

In keeping with the significance of the production of mineral fuels—and thus their importance to the economy of the State—the Survey continues to devote a major portion of its efforts to these commodities. During the past fiscal year, for example, the Survey conducted programs to assess heavy-oil resources in northeastern Oklahoma, to investigate the subsurface geology and petroleum potential of the Arkoma Basin, to develop coal-resources maps for selected counties, and to evaluate the uranium potential in west-central and north-central Oklahoma. It is anticipated that most of these studies will produce publishable results during the coming fiscal year.

The heavy-oil project in northeastern Oklahoma will be completed during fiscal 1979. This study will probably be followed by a similar study in southern

Oklahoma, where heavy-oil occurrences have been known for many years and where some material was commercially produced as recently as the early 1950's.

The subsurface investigation of rocks of the Hunton Group in the Arkoma Basin will be completed in the early part of the coming fiscal year, with publication of the results anticipated by mid-1979. The information provided in this report will be similar to that contained in Bulletin 121, which describes Hunton rocks in the Anadarko Basin of Oklahoma.

Mapping of coal-bearing strata in Craig and Nowata Counties, northeastern Oklahoma, is progressing toward a projected completion date of mid-1979, with publication of the results to follow shortly thereafter. This project will provide information from these counties on the location, thickness, and composition of coal beds; coal resources; and mined areas. Supplementary information will include physical properties of the overlying and underlying rock units.

A study of uranium resources has been initiated for the areas in Oklahoma encompassed by the Clinton and Enid 1° by 2° quadrangles. This project, supported by Bendix Field Engineering Corp. and funded by the U.S. Department of Energy, is part of the National Uranium Resource Evaluation (NURE) program, which is designed to evaluate the nation's uranium potential using quadrangles of this scale as base maps for data compilation. This part of the NURE program is scheduled for completion in early 1980.

The Survey has also continued to compile and publish annual data on petroleum exploration and production in the State and has released a revised map of active coal mines with data current through 1976.

Geologic Mapping and Minerals Investigations

Geologic mapping is a primary responsibility of the Survey. Such mapping is also a necessary prerequisite for most of the Survey's other programs. This is especially true for minerals investigations. The preparation of local and regional surface and subsurface geologic maps is therefore one of the Survey's highest priorities.

During the past fiscal year the Survey published Bulletin 122, covering the geology and mineral resources of Muskogee County. This report, by the late Malcolm C. Oakes, provides important geological information for a variety of future geologically related studies.

The field work and manuscript for a geologic report on Bryan County was completed, with publication expected in early 1979. Likewise, a geologic report on Custer County has been completed, with publication expected in late 1978. A geologic report on Noble County, which had been awaiting final processing for some time, will be published in mid-1979. The geologic map and text for a report on Payne County were also reviewed and accepted for publication.

Field studies were continued in Alfalfa, Marshall, and Washita Counties, with the anticipated completion of the Marshall County report in late 1979 and publication in early 1981.

Regional subsurface studies were continued by investigation of the Hunton

strata in the Arkoma Basin, mapping of selected subsurface markers in north-central Oklahoma, and related correlation studies in northeastern Oklahoma.

A study of the geology and mineral occurrences in the Southwest Davis Zinc Field, Arbuckle Mountains, is in the final stages of preparation and should be completed during the next fiscal year.

An inventory of surface-mining activities in the State exclusive of coal was continued, with completion expected in early 1979. This project, supported in part by a grant from the U.S. Geological Survey, is designed to identify all current and former surface-mining operations in the State and to determine the quantity of material mined at each locality. An assessment of reclamation needs for abandoned surface mines will also be made.

A water-sampling program was conducted by the Survey as a part of the National Uranium Resource Evaluation (NURE) program in the Oklahoma City, Ardmore, Lawton, and Enid 1° by 2° quadrangles. This phase of the Survey's NURE investigations is being funded by the U.S. Department of Energy through Oak Ridge National Laboratories and will be completed in the next fiscal year.

Water Programs

Water-resources investigations were conducted during the past fiscal year, as in prior years, in cooperation with the U.S. Geological Survey. This cooperative program is focused on a regional assessment of the State's water resources with particular emphasis on ground water. All field work was completed for the hydrologic-atlas program, and cartographic and editorial work on the manuscript products is continuing. During the past fiscal year, the hydrologic atlas for the Lawton quadrangle was published. The atlas for the Enid quadrangle is expected to be in print by the spring of 1979.

Another part of the cooperative water-resources program is a continuing study of several major aquifers in the State, including the Vamoosa, Antlers, and Arbuckle aquifers. Field work and preliminary results have been released in open file for the Vamoosa and Antlers, with the Arbuckle due for completion in the next fiscal year. Additional study of the Vamoosa has been undertaken because of uncertain results suggesting possible salt-water intrusion into the fresh-water portion of the aquifer. Publication of the aquifer studies is scheduled by the Survey in subsequent fiscal years.

A third part of the cooperative program is the study of the hydrology of the coal fields in eastern Oklahoma. This program is designed to provide basic information on the availability and quality of water in the coal region in order to evaluate the effects of surface mining on water quality. The Survey is participating in this program by analyzing the water samples collected.

Several miscellaneous water investigations were undertaken. Of particular significance was a study of the quality of water in the Miami-Picher lead-zinc mines. The results of this study show that the water filling these mines contains several metals in solution that could pose potential problems in the near future. A further evaluation of this condition is planned for the coming fiscal year.

Environmental Geology

A number of projects were conducted by the Survey during the past fiscal year that were concerned with the environmental consequences of mineral development and other industrial operations. A study of favorable geologic units in Oklahoma for industrial-waste disposal, funded in part by a grant from the State Department of Economic and Community Affairs (DECA), was designed to determine which formations possess the desired properties for safe disposal of industrial and municipal wastes.

The regional assessment of seismicity and tectonic analysis in Oklahoma has continued. This project, part of a 5-year study of seismicity in the Mid-continent region, is funded in part by a grant from the U.S. Nuclear Regulatory Commission. It involves the development of a statewide seismic-monitoring network of stations keyed to the geophysical observatory at Leonard, in eastern Oklahoma. This geophysical facility was transferred to the Survey at the beginning of the new fiscal year (July 1978). Other parts of the study are field geophysical investigations of gravity and magnetics and subsurface mapping of selected stratigraphic markers.

The Survey staff continues to provide an assessment of the geologic factors related to proposed highway-construction programs in the State as well as to other major State- and local-government construction projects.

Public Service

As usual, steady demands have been made on Survey personnel for public service and assistance. Staff members answered many inquiries and met personally with scientists and others who came to the Survey offices seeking information on various facets of Oklahoma geology.

For several years the Survey has served as the repository for an increasing number of open-file reports, principally from cooperating federal agencies, such as the Department of Energy and the U.S. Geological Survey. These reports are available for public inspection at the Survey's offices.

Researchers have made increasing use of three of the Survey's principal resources. Two of these are shared with The University of Oklahoma—the Geology and Geophysics Library and the Core and Sample Library. The third is the Survey's recently acquired library of geophysical well logs, housed in the main office. This collection has been established through an agreement with Petro-Wells, Inc., Denver, which has microfilmed logs released to open file by the Oklahoma Corporation Commission; the Survey serves as the official repository for this file. The logs are stored on microfilm cassettes and are arranged by section, township, and range. An integral part of this library is a microfilm reader-printer, from which portions of logs can be printed at nominal cost.

Acknowledgments

It would be virtually impossible for the Survey to carry out its constitutionally mandated duties without wholehearted cooperation and effort on the part of many citizens and organizations throughout the State. To all you individuals, civic groups, company personnel, members of academic institutions, and representatives of State and federal agencies, we extend our deepest thanks.

—CHARLES J. MANKIN, *Director*

APPENDIX A
Survey Staff, 1977-78 Fiscal Year

Professional

Thomas W. Amsden
Robert O. Fay
David A. Foster
S. A. Friedman
Elizabeth A. Ham[1]
Rosemary Hardage[2]
William E. Harrison
LeRoy A. Hemish[3]
Kenneth S. Johnson
Kenneth V. Luza
Charles J. Mankin
Reza Moussavi-Harami[4]
John F. Roberts
William D. Rose
Judy A. Russell[5]
Leonard R. Wilson[6]

Part-Time Professional

George G. Huffman
(The University of Oklahoma)
M. C. Gilbert
(Virginia Polytechnic Institute)
Frederick H. Manley
(Georgia State University)
A. J. Myers
(The University of Oklahoma)
J. D. Naff
(Oklahoma State University)
Patrick K. Sutherland
(The University of Oklahoma)

Temporary Professional

C. R. Robison (Visiting Geol. I)
(Jan. 78–June 78)
E. A. Schmuckli III (Visiting Res. Assoc.) (Jan. 78–June 78)

Technical

Cartographic
Marion E. Clark
Roy D. Davis
David M. Deering[7]
Kelly D. Hilburn
Mary Ellen Kanak[8]
Wendy Oberlin[9]
Joseph M. Zovak[10]

Core and Sample Library
Eldon R. Cox
Gary L. Wullich

Electron Microscope Technician
William F. Chissoe III[11]

Geological Technician
Robert D. Wingate

Laboratory Technician
Robert M. Powell

Maintenance
David O. Pennington[12]

Secretarial
Betty D. Bellis
Helen D. Brown
Margarett K. Civis
Lavcda F. Hensley
Paula A. Hewitt
Mitzi M. Moore[13]
Gwen C. Williamson

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[1] Changed to Professional July 77.
[2] Terminated February 78.
[3] Appointed December 77.
[4] Terminated July 77.
[5] Appointed February 78.
[6] Retired July 77.
[7] Terminated December 77.
[8] Appointed December 77.
[9] Terminated October 77.
[10] Appointed February 78.
[11] Transferred to OU June 30, 78.
[12] Appointed November 77.
[13] Appointed March 78.

APPENDIX B
List of Survey Publications Issued, 1977-78 Fiscal Year

New Publications

Bulletin 122.—*Geology and Mineral Resources (Exclusive of Petroleum) of Muskogee County, Oklahoma*, by Malcolm C. Oakes. 78 pages, 8 figures, 2 plates. Issued September 1977.

Bulletin 123.—*Trilobites of the Haragan, Bois d'Arc, and Frisco Formations (Early Devonian), Arbuckle Mountains Region, Oklahoma*, by K. S. W. Campbell. 227 pages, 36 figures, 40 plates, 5 tables. Issued December 1977.

Circular 78.—*Calceocrinids from the Bromide Formation (Middle Ordovician) of Southern Oklahoma*, by James C. Brower. 27 pages, 2 figures, 4 plates, 3 tables. Issued November 1977.

Hydrologic Atlas 6.—*Reconnaissance of the Water Resources of the Lawton Quadrangle, Southwestern Oklahoma*, by John S. Havens. 4 color sheets including geologic map, scale 1:250,000. Issued October 1977.

List of Available Publications.—20 pages. Issued February 1978.

Oklahoma Geology Notes.—Six bimonthly issues (August 1977–June 1978) containing 264 pages.

Publications Reprinted

Bulletin 67.—*Geology and Mineral Resources of Haskell County, Oklahoma*, by Malcolm C. Oakes and M. M. Knechtel. 136 pages, 5 tables, 8 figures. Issued 1948; fourth printing, November 1978.

Bulletin 68.—*Geology and Coal and Natural Gas Resources of Northern Le Flore County, Oklahoma*, by M. M. Knechtel. 76 pages, 3 tables, 1 figure. Issued 1949; third printing, November 1977.

Circular 64.—*Copper in the Flowerpot Shale (Permian) of the Creta Area, Jackson County, Oklahoma*, by William E. Ham and Kenneth S. Johnson. 32 pages, 3 tables, 2 plates, 10 figures. Issued 1964; third printing, January 1978.

Coal Report.—*An Investigation of the Coal Reserves in the Ozarks Section of Oklahoma and their Potential Uses*, by S. A. Friedman. 117 pages, 24 figures, 77 tables. Issued 1974; fourth printing, October 1977.

Guidebook 9.—*Guide to Roman Nose State Park, Blaine County, Oklahoma*, by Robert O. Fay. 31 pages, 4 plates, 9 figures.

Guidebook for 1973 Annual GSA Meeting.—*Regional Geology of the Arbuckle Mountains, Oklahoma*, by William E. Ham, compiled by T. L. Rowland, with contributions by Thomas W. Amsden, Rodger E. Denison, James R. Derby, Robert O. Fay, A. Allen Graffham, T. L. Rowland, Richard L. Squires, James H. Stitt, and Elliott W. Wiltse. Prepared originally as guidebook for field trip no. 5, reprinted for field trip no. 1. 61 pages, 54 figures, 1 map. Issued 1973; third printing, April 1978.

Guidebook for 1974 Annual Meeting of GSA South-Central Section Field Trip.—*Depositional Environments of Selected Pennsylvanian Sandstones and*

Carbonates of Oklahoma, by John W. Shelton and T. L. Rowland. 8th annual meeting, guidebook for field trip no. 3. 75 pages, 33 figures, 15 plates. Issued 1974; third printing, May 1978.

Mineral Report 8.—*Copper in the "Red Beds" of Oklahoma*, by C. A. Merritt. 20 pages. Issued 1940; third printing, April 1978.

Mineral Report 15.—*Carbonizing Properties of McAlester Bed Coal from Dow No. 10 Mine, Dow, Pittsburg County, Okla. (Preliminary Report)*, by Joseph D. Davis and D. A. Reynolds. 12 pages, 8 tables, 1 figure. Issued 1942; third printing, December 1977.

Mineral Report 27.—*Uranium in Oklahoma, 1955*, by Carl C. Branson, A. L. Burwell and G. C. Chase. 22 pages, 2 figures. Issued 1955; third printing, March 1978.

Mineral Report 30.—*Asphaltite in the Ouachita Mountains of Southeastern Oklahoma*, by William E. Ham. 12 pages, 3 tables, 1 map. Issued 1956; fourth printing, February 1978.

Mineral Report 33.—*Uranium-bearing Carbonaceous Nodules of Southwestern Oklahoma*, by James W. Hill. 6 pages, 2 figures, 1 table, 1 map. Issued 1957; reprinted March 1978.

APPENDIX C
Publications by Survey Staff, 1977-78 Fiscal Year

ROBERT O. FAY

Geologic Map-Sheet 1, *in* Reconnaissance of the water resources of the Lawton Quadrangle, southwestern Oklahoma: U.S. Geological Survey and Oklahoma Geological Survey, HA-6 (with John Havens).

Ore deposits of the USSR, A Review: Oklahoma Geology Notes, v. 38, p. 102.

S. A. FRIEDMAN

Coal, *in* Cochran, Wendell (editor), The year in review: earth science in 1977: Geotimes, January 1978, p. 20–21.

Desmoinesian coal deposits in part of the Arkoma Basin, eastern Oklahoma: Oklahoma City Geological Society, Field trip guidebook No. 2 for the American Association of Petroleum Geologists Annual National Meeting, Oklahoma City, Oklahoma, 62 p.

Mapping in Oklahoma's coal region progresses: Oklahoma Geology Notes, v. 38, p. 15–16.

Map of eastern Oklahoma showing active coal mines (January 1, 1977): Oklahoma Geological Survey, scale 1:500,000.

Oklahoma, *in* 1977 Keystone coal industry manual: New York, McGraw-Hill Mining Publications, p. 648–653.

Toronto Ho, *in* The Coal Geologist, newsletter of the Coal Geology Division, Geological Society of America, v. 5, no. 1, 3 p.

ELIZABETH A. HAM

Bibliography and index of Oklahoma geology, 1976: Oklahoma Geology Notes, v. 37, p. 91–143.

Malcolm Christie Oakes (1890–1977): Oklahoma Geology Notes, v. 38, p. 9–13.

Oklahoma Geology Notes: Oklahoma Geological Survey, v. 37, nos. 4–6, v. 38, nos. 1–3, 264 p. (ed., with Rosemary L. Hardage, William D. Rose, and Judy A. Russell).

ROSEMARY L. HARDAGE

Oklahoma Geology Notes: Oklahoma Geological Survey, v. 37, nos. 4–6, v. 38, no. 1, 188 p. (ed., with Elizabeth A. Ham, William D. Rose, and Judy A. Russell).

WILLIAM E. HARRISON

Experimental diagenetic study of a modern lipid-rich sediment: Chemical Geology, v. 21, p. 315–334.

KENNETH S. JOHNSON

Area of mineral production on north flank of Arbuckle Anticline: Oklahoma Geology Notes, v. 37, p. 90 (cover-photo description).

Faulted strata on south flank of Arbuckle Mountains: Oklahoma Geology Notes, v. 37, p. 150 (cover-photo description).

Major sources of chlorides in the Arkansas River in Oklahoma [abstract]: Geological Society of America Abstracts with Programs, v. 10, p. 8 (with S. T. Gay).

Ordovician limestones in the Arbuckle Mountains: Oklahoma Geology Notes, v. 37, p. 182 (cover-photo description).

Permian salt deposits in Texas Panhandle and western Oklahoma [abstract]: American Association of Petroleum Geologists Bulletin, v. 62, p. 526–527.

Salt deposits in the United States and regional characteristics important for storage of radioactive wastes: prepared for Union Carbide Corp., Nuclear Division, Office of Waste Isolation, 188 p. (with Serge Gonzales).

Surface-mined-lands inventory and related land-use practices in Oklahoma [abstract]: Geological Society of America Abstracts with Programs, v. 10, p. 22 (with K. V. Luza).

KENNETH V. LUZA

Regional geological and seismological studies in the Midcontinent: American Nuclear Society Transactions, v. 27, p. 155.

Regional seismic and geologic evaluations of Nemaha Uplift, Oklahoma, Kansas, and Nebraska: Oklahoma Geology Notes, v. 38, p. 48–58.

Seismicity and tectonic relationships of the Nemaha Uplift in Oklahoma: U.S. Nuclear Regulatory Commission, 67 p. (with R. L. DuBois, J. E. Lawson, P. Foster, and L. Koff).

Surface-mined-lands inventory and related land-use practices in Oklahoma [abstract]: Geological Society of America, south-central section, v. 10, p. 22 (with K. S. Johnson).

Waste-treatment-management planning in Oklahoma: Oklahoma Geology Notes, v. 37, p. 75–79.

CHARLES J. MANKIN

Energy Resources of Oklahoma: Interstate Oil Compact Commission Committee Bulletin, v. 20, p. 52–55.

Oklahoma Geological Survey annual report, July 1, 1976–June 30, 1977: Oklahoma Geology Notes, v. 37, p. 183–197.

Opportunities for increasing natural gas production in the near term, v. 1–The Tiger Shoal Field, v. 2–East Cameron Block 64 Field, v. 3–Eugene Island Block 266 Unit, v. 4–The Vermilion Block 14 Unit, v. 5–The South Marsh Island Block 48 Field, v. 6–The East Cameron Block 271 Field; six interim reports to the U.S. Department of the Interior from the Committee on Gas Production Opportunities of the National Research Council; Charles J. Mankin, chairman.

The potential for increasing production of natural gas from existing fields in the near term, a final report to the Secretary of the Interior from the Committee on Gas Production Opportunities of the National Research Council; Charles J. Mankin, chairman.

JOHN F. ROBERTS

Statistics of Oklahoma's petroleum industry, 1976: Oklahoma Geology Notes, v. 37, p. 203–210.

WILLIAM D. ROSE

Oklahoma Geology Notes: Oklahoma Geological Survey, v. 37, nos. 4–6, v. 38, nos. 1–3, 264 p. (ed., with Elizabeth A. Ham, Rosemary L. Hardage, and Judy A. Russell).

JUDY A. RUSSELL

Oklahoma Geology Notes: Oklahoma Geological Survey, v. 38, nos. 1–3, 116 p. (ed., with Elizabeth A. Ham, Rosemary L. Hardage, and William D. Rose).

Whatever happened to Beer City—or for that matter, Gene Autry?—See *Ghost Towns of Oklahoma*: Oklahoma Geology Notes, v. 38, p. 65.

LEONARD R. WILSON

Memorial to Carl Branson: American Association of Petroleum Geologists Bulletin, v. 61, p. 2017–2019.

Palynological study of Feature 4, Mi-63, from an early Caddonian village in eastern Oklahoma, *in* Papers in Highway Archaeology, Number 3: Oklahoma Highway Archaeological Survey, no. 3, p. 243–257.

APPENDIX D
Papers Presented by Survey Staff at Professional Meetings
1977-78 Fiscal Year

Oklahoma Aggregate Producers Association, Annual Meeting
Shangri-la Lodge, Oklahoma, August 5, 1977
KENNETH V. LUZA
General geology of Oklahoma with emphasis on sand and gravel

Industrial Development Institute, Oklahoma Center for Continuing Education
Norman, Oklahoma, August 9 and 11, 1977
CHARLES J. MANKIN
Energy Resources—Alternatives and Trends

Tulsa Geological Society
Tulsa, Oklahoma, September 6, 1977
CHARLES J. MANKIN
Role of the Oklahoma Geological Survey in the development of the State's natural resources

Commission Internationale de Microflore du Paleozique
Leon, Spain, September 6, 1977
LEONARD R. WILSON
Palynological successional patterns of Oklahoma Carboniferous (Pennsylvanian) coal seams

Engineering Club of Oklahoma City, Monthly Meeting
Oklahoma City, Oklahoma, September 7, 1977
KENNETH S. JOHNSON
Strip mining and reclamation in eastern Oklahoma

Oklahoma State University, Department of Geology Colloquium
Stillwater, Oklahoma, October 6, 1977
KENNETH S. JOHNSON
Coal mining and land reclamation in eastern Oklahoma

Sigma Gamma Epsilon, Gamma Chapter at The University of Oklahoma
Norman, Oklahoma, October 6, 1977
CHARLES J. MANKIN
Oklahoma's mineral and energy resources

Osage Hills Gem and Mineral Society, Biennial Rock and Mineral Show
Bartlesville, Oklahoma, October 8–9, 1977
KENNETH S. JOHNSON
Strip mining and land reclamation in eastern Oklahoma

Fort Worth Geological Society, Monthly Meeting
Fort Worth, Texas, October 10, 1977
KENNETH S. JOHNSON
Permian evaporites in north-central Texas

Oklahoma City Geological Society
Oklahoma City, Oklahoma, October 13, 1977
THOMAS W. AMSDEN
Middle Paleozoic history of the Anadarko and Arkoma Basins

Oklahoma State University, Department of Geology Weekly Seminar
Stillwater, Oklahoma, October 13, 1977
S. A. FRIEDMAN
Coal resources of Oklahoma and environments of coal deposition

Association of Professional Geological Scientists, Oklahoma Section Annual Meeting
Oklahoma City, Oklahoma, October 14–15, 1977
CHARLES J. MANKIN
National energy affairs

American Association of Stratigraphic Palynologists, Annual Meeting
Tulsa, Oklahoma, October 19–22, 1977
KENNETH S. JOHNSON
Coal mining and land reclamation in eastern Oklahoma
LEONARD R. WILSON
Palynological stratigraphy in North America, past, present and future

Tulsa Geological Society
Tulsa, Oklahoma, November 1, 1977
LEONARD R. WILSON
Palynology in deep basin stratigraphic studies

Oklahoma Mining and Reclamation Association, First Meeting
Muskogee, Oklahoma, November 11, 1978
S. A. FRIEDMAN
Coal geology in Oklahoma

Phillips University, Seminar on Petroleum and Natural Gas Reserves
Enid, Oklahoma, November 21–22, 1977
CHARLES J. MANKIN
Natural gas reserves

Oklahoma State Bar Association, Mineral Law Division Annual Meeting
Oklahoma City, Oklahoma, December 2, 1977
S. A. FRIEDMAN
Coal deposits and resources of Oklahoma

American Nuclear Society, Annual Fall Meeting
San Francisco, California, December 2, 1977
KENNETH V. LUZA
Regional geological and seismological studies in the Midcontinent

Oklahoma State University, Department of Geology Seminar
Stillwater, Oklahoma, December 8, 1977
CHARLES J. MANKIN
Oklahoma's role in the national energy picture

Southwest Legislative Council, Regional Meeting
Oklahoma City, Oklahoma, January 6, 1978
CHARLES J. MANKIN
Coal resources of the southwest region

Fort Worth Geological Society, Weekly Meeting
Fort Worth, Texas, January 9, 1978
THOMAS W. AMSDEN
Middle Paleozoic history of the Anadarko and Arkoma Basins

Western Interior Coal Geologists, Annual Meeting
Lawrence, Kansas, February 28, 1978
S. A. FRIEDMAN
Progress of the coal investigations program at the Oklahoma Geological Survey

Geological Society of America, South-Central Section Meeting
Tulsa, Oklahoma, March 6–7, 1978
KENNETH S. JOHNSON
Major sources of chlorides in the Arkansas River of Oklahoma (with S. Thomas Gay)
Surface-mined lands inventory and related land-use practices in Oklahoma (with Kenneth V. Luza)
KENNETH V. LUZA
Surface-mined lands inventory and related land-use practices in Oklahoma (with Kenneth S. Johnson)

West Texas Geological Society, Weekly Meeting
Midland, Texas, March 14, 1978
THOMAS W. AMSDEN
Middle Paleozoic history of the Anadarko and Arkoma Basins

U.S. Geological Survey Water Resource Divisions for Kansas and Oklahoma Districts, Joint Meeting
Wichita, Kansas, March 15, 1978
CHARLES J. MANKIN
Role of the Oklahoma Geological Survey in the development of the State's natural resources

Annual State Water Planning Meeting
Oklahoma City, Oklahoma, March 16, 1978
CHARLES J. MANKIN
Oklahoma Geological Survey's State water resources activities

Scientists' Institute for Public Information, Congressional Seminar
Washington, D.C., April 7, 1978
CHARLES J. MANKIN
Natural gas resources and reserves

American Association of Petroleum Geologists, National Annual Meeting
Oklahoma City, Oklahoma, April 9–12, 1978
LEROY A. HEMISH
Desmoinesian coal deposits in part of the Arkoma Basin, eastern Oklahoma
KENNETH S. JOHNSON
Permian salt deposits in the Texas Panhandle and western Oklahoma

University of Oklahoma Faculty Senate
Norman, Oklahoma, April 10, 1978
CHARLES J. MANKIN
Energy Resources Center

American Petroleum Institute
Cambridge, Massachusetts, April 20, 1978
CHARLES J. MANKIN
Status report on opportunities for accelerating gas production from the Gulf outer continental shelf in the near term

Association of Professional Geological Scientists
Oklahoma City, Oklahoma, May 9, 1978
CHARLES J. MANKIN
The new Energy Resources Center at Oklahoma University—current and projected activities

Oklahoma Center for Continuing Education, Faculty Development Seminar on Conventional Energy Resources
Norman, Oklahoma, June 15, 1978
KENNETH V. LUZA
The role of uranium in the nuclear fuel cycle

Interstate Oil Compact Commission
Tulsa, Oklahoma, June 26, 1978
CHARLES J. MANKIN
Mineral and energy resources of Oklahoma

Oklahoma County Assessors Annual State Workshop, Panel on Coal
Stillwater, Oklahoma, June 28, 1978
S. A. FRIEDMAN
The Oklahoma coal industry and taxation

Oklahoma Center for Continuing Education, Energy Institute sponsored by OU College of Engineering
Norman, Oklahoma, June 30, 1978
KENNETH S. JOHNSON
Geology and exploration for coal, uranium, and petroleum resources

OGS Issues Report on Quarry Mountain Brachiopods

Bulletin 125, *Articulate Brachiopods of the Quarry Mountain Formation (Silurian), Eastern Oklahoma*, by Thomas W. Amsden, was published recently by the Oklahoma Geological Survey. The 75-page bulletin contains descriptions of 25 brachiopod species collected from Adair, Cherokee, and Sequoyah County outcrops of the upper part of the Quarry Mountain Formation, a division of the Hunton Group of Ordovician, Silurian, and Devonian age. Six of the species are new, as are one subfamily, two genera, and a subgenus.

Tom Amsden, geologist with the Survey since 1955, is known internationally for his stratigraphic and paleontologic studies of the Hunton Group, a major target for petroleum exploration. The Quarry Mountain investigation represents an extension of his previously published works on other formations of the Hunton and of a landmark publication on the occurrences of these units in the Anadarko Basin of western Oklahoma that was published in 1976 as OGS Bulletin 121.

Tom explains that an understanding of the biostratigraphy of the Quarry Mountain Formation is the key to gaining an understanding of the stratigraphy of the Hunton in the entire Arkoma Basin region. His current work on the Hunton of the Arkoma Basin will be published as a companion volume to Bulletin 121.

In addition to detailed systematic descriptions of the brachiopods, Bulletin 125 incorporates information on the biostratigraphy, lithostratigraphy, environments of deposition, age, and correlation of the Quarry Mountain Formation. The publication contains 13 plates and 22 text-figures, including an extensive range chart for Hunton brachiopod genera.

Bulletin 125 can be ordered from the Survey at the address on the front cover. The price is $6.50 for paperbound and $8.50 for hardbound copies.

Chinese Geologists Visit OU and OGS

Thirteen geologists and petroleum engineers from the Peoples Republic of China visited the campus of The University of Oklahoma October 20–21 to inspect the Energy Resources Center and other energy-related facilities, including the Oklahoma Geological Survey, the School of Geology and Geophysics, the School of Petroleum and Geological Engineering, and the Oil Well Blowout Prevention Systems School. Charles J. Mankin, director of the Oklahoma Geological Survey and of the Energy Resources Center, was host for the Norman visit.

The primary interest of the group, which was brought to this country by the National Council for U.S.-China Trade of the World Trade Commission, was in petroleum exploration, drilling technology, and computer applications to the petroleum industry. Their scheduled tour took them to several petroleum companies, to IBM Corp., to U.S. Geological Survey centers in Reston, Virginia, and Denver, and to two other universities besides OU—The University of Texas at Austin and Stanford University.

Staff members of the Oklahoma Geological Survey gave the visitors an opportunity to review the programs and activities of the agency. They received briefings from Kenneth S. Johnson on the overall program of the Survey. Kenneth V. Luza explained activities in environmental geology; William E. Harrison discussed projects in petroleum geochemistry; and Jim Lawson described the facilities for earthquake detection and analysis at the Oklahoma Geophysical Observatory near Tulsa.

You Mean It's Not Aerial Geology?

Our latest candidate for Bob Bates' *Geotimes* column was called to our attention recently by a nameless wag in Tulsa. It seems that we had run an abstract in an issue of *Oklahoma Geology Notes* earlier this year in which a certain stratigraphic unit was characterized as having an "unusual aerial distribution." Of course the term is "areal," not "aerial." As our Tulsa friend pointed out, "aerial" must mean that the formation is up in the air. Hm, sounds like the way things are around here sometimes.

Kenneth Johnson Named OGS Associate Director

Charles J. Mankin, director of the Oklahoma Geological Survey, has announced that Kenneth S. Johnson, geologist with the Survey and adjunct professor in The University of Oklahoma's School of Geology and Geophysics, has accepted the additional title and responsibilities of OGS associate director.

Ken Johnson has been a geologist with the Survey since 1962, with a 2-year break from 1965 to 1967 while he was acquiring a Ph.D. in geology from the University of Illinois. Earlier degrees include a B.A. in geology, a B.S. in geological engineering, and an M.S. in geology, all from OU. He has taught courses in economic and environmental geology for the School since 1972. In the summers of 1973 through 1976 he led a fuels field course to the Colorado Plateau, offered by the Survey and the University.

Ken's chief interests are in the mineral resources of Oklahoma, particularly those in evaporite deposits, and in environmental geology. He is widely known for his work on Permian sedimentary rocks, having published numerous articles and delivered many papers on Permian copper shales, gypsum, salt, and uranium at regional, national, and international sessions. In the spring of 1974 he lectured on these subjects during a 5-week tour of Germany and Austria, and in September of that year he presented an invited paper on "Permian Copper Shales of Southwestern United States" at the Centenary Meeting of the Belgian Geological Society in Liège. In 1975 he was invited to represent the Oklahoma Geological Survey and The University of Oklahoma at a NATO-sponsored conference on "Continental Permian Sediments" at the University of Mainz in West Germany. Following the NATO conference he joined faculty members of the Paris School of Mines for field study of mineral deposits in southern France and later delivered two lectures in Paris on Permian copper shales and uranium deposits of the southwestern United States.

Ken served as co-chairman of a 1974 stratiform-copper symposium at the annual meeting of the South-Central Section of The Geological Society of America and was co-editor of the resulting publication, OGS Circular 77. He has led and otherwise participated in the annual Industrial Minerals Forum. He is co-editor of the 1977 proceedings volume, which is being published as OGS Circular 79. He is currently involved in a grant project under the U.S. Department of Energy's National Uranium Resource Evaluation (NURE) pro-

gram to investigate potentially economic occurrences of uranium. The area under examination in Oklahoma covers about one-sixth of the State. He is also engaged in completing a 3-year inventory of all of Oklahoma's surface-mined lands to determine the status of the State's mineral resources and land-reclamation programs.

This mined-lands inventory is an expansion of Ken's work published in 1974 as OGS map GM-17, *Maps and Description of Disturbed and Reclaimed Surface-Mined Coal Lands in Eastern Oklahoma*, a significant contribution to environmental geology that also presented information on coal resources.

Together with Kenneth V. Luza, engineering and environmental geologist on the Survey staff, and John F. Roberts, OGS petroleum geologist, he has prepared a map and report on industrial-waste disposal, which will be published as an OGS circular. Johnson is also conducting investigations of salt-water pollution of the Arkansas and Red River basins.

The first three volumes of the OGS Educational Publication series were prepared by Johnson. These are nontechnical publications designed to assist teachers, students, and the general public. He has led many field trips for such groups and for professional geologists.

In his new, added capacity, Ken will be able to offer even more to the Survey and to the public it serves.

USGS Releases New Open-File Reports

Four recent open-file reports of the U.S. Geological Survey that should be of interest to Oklahomans are:

Report 78–161, *High-Flow Frequencies for Selected Streams in Oklahoma*, by Thomas L. Huntzinger. The 30-page report, prepared in cooperation with the Oklahoma Water Resources Board, contains statistical analyses of high-flow characteristics for numerous Oklahoma creeks and rivers.

Report 78–166, *Low-Flow Characteristics of Oklahoma Streams*, by Thomas L. Huntzinger. This 93-page report gives measurements of flow during low periods for streams in Oklahoma and analyses of low-flow characteristics.

Report 78–294, *Chemical Quality of Water in Abandoned Zinc Mines in Northeastern Oklahoma and Southeastern Kansas*, by Stephen J. Playton, R. E. Davis, and R. G. McClaflin. The 67-page report offers data on chemical and physical properties of water from seven mine shafts. These properties show the water from the mines to be unsuitable for most uses. Plans call for the report to be published as a circular of the Oklahoma Geological Survey.

Report 78–357, *Ground-Water Records for eastern Oklahoma, Part 2—Water-Quality Records for Wells, Test-Holes, and Springs*, by John S. Havens. The 130-page report is a continuation of previous studies in eastern Oklahoma and is concerned with the chemical quality of the water supplies in this area.

Single copies of all reports are available without charge by writing the District Chief, U.S. Geological Survey, Water Resources Division, 201 NW 3d Street, Room 621, Oklahoma City, Oklahoma 73102.

STATISTICS OF OKLAHOMA'S PETROLEUM INDUSTRY, 1977

William E. Harrison[1]

In 1977, operators drilled 4,939 exploration and production wells in Oklahoma, an increase of 17 percent over the number drilled the previous year (table 1, fig. 1). There were 473 exploratory (wildcat) wells drilled, 39 more (9 percent) than were drilled in 1976. Statewide, 23 percent of the wildcats drilled were completed as gas wells, and 20 percent were completed as oil wells. The most active counties were Noble, with 25 wildcat wells (1 oil, 1 gas, and 23 dry holes, a success ratio of 8 percent); Logan, with 24 wildcat wells (14 oil, 1 gas, 9 dry holes, a success ratio of 63 percent); and Major, which had the

TABLE 1.—DRILLING ACTIVITY IN OKLAHOMA, 1977
(Source: *Oil and Gas Journal*, v. 76, no. 5, January 30, 1978, and API data)

	1977				1976
	Oil	Gas	Dry	Total	Total
ALL WELLS					
Number of wells	2,253	1,092	1,594	4,939	4,393
Total footage				24,277,757	22,364,701
Average footage				4,915	5,091
EXPLORATION WELLS					
Number of completions	66	77	330	473	434
Percentage of completions				30	31
Total footage				2,980,545	2,763,891
Average footage				6,301	6,368
DEVELOPMENT WELLS					
Number of completions	2,187	1,015	1,264	4,466	3,252
Percentage of completions				72	70
Total footage				21,297,212	19,282,232
Average footage				4,769	5,098

[1] Geologist, Oklahoma Geological Survey.

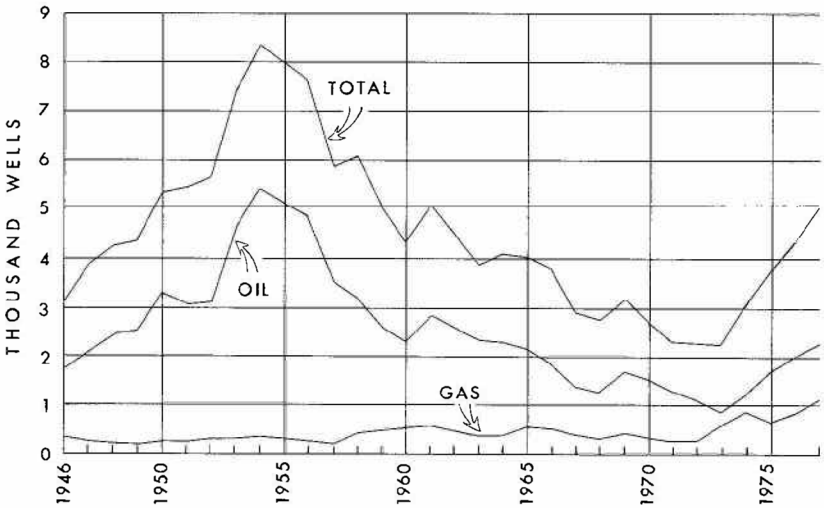


Figure 1. Graph showing total wells drilled, oil wells completed, and gas wells completed in Oklahoma, 1946-77 (source: **Oil and Gas Journal**).

highest percentage of wildcats completed as producers (8 out of 9 wells, a success ratio of 89 percent).

World Oil (v. 186, no. 3) reported that independent producers drilled 82 percent of the total wells drilled in the United States. In Oklahoma they drilled 93 percent of the total wells.

Table 1 summarizes drilling activity during 1977 and compares it with that of the previous year. The average total depth of both exploration and production wells was less in 1977 than in 1976.

Ten giant fields in Oklahoma are listed in table 2. (A giant field is one that has an estimated recovery of more than 100 million barrels of oil.) This represents a decrease in the number of giant fields from the 22 listed for 1976. The reason for the reduction is the dropping of older giant fields from the list as a result of declining production and low remaining reserves.

Table 3 lists cumulative and yearly production and the value of all petroleum products produced to January 1, 1978. Table 4 compares petroleum and natural-gas production for the last two years. The number of producing oil wells increased by 1,265 over the number in 1976, while average production per well declined slightly. The annual production of natural gas was up slightly from the 1976 figures, but the market value was more than 67 percent greater

TABLE 2.—GIANT OIL FIELDS OF OKLAHOMA, 1977
(Source: *Oil and Gas Journal*, v. 76, no. 5, January 30, 1978)

Field	1977 production (1,000 bbls)	Cumulative production (1,000 bbls)	Estimated reserves (1,000 bbls)	Number of wells
Burbank	2,905	511,538	29,462	1,033
Eola-Robberson	2,217	116,983	23,017	490
Fitts	3,146	159,370	30,630	650
Golden Trend	4,942	410,846	44,154	1,002
Healdton	3,831	316,411	33,589	1,403
Hewitt	4,724	244,633	45,367	1,262
Oklahoma City	1,542	735,748	14,252	223
Postle	3,918	84,239	35,761	313
Sho-Vel-Tum	28,821	1,095,342	234,658	8,010
Sooner Trend	8,653	217,190	62,810	3,396

than in 1976. Natural-gas liquids decreased in marketed production but increased in market value by 25 percent over the 1976 value (table 4).

Figure 2 is a map showing the 69 counties that had exploratory- and (or) development-drilling activity. The drilled depths of the wells are indicated by various patterns. The Anadarko Basin has been the site of most of the State's deep drilling for the last few years.

Figure 3 shows a decrease in natural-gas reserves from 12.4 trillion cubic feet to 11.7 trillion cubic feet. The ratio of reserves to production was 7.04, down from 7.51 the previous year.

Figure 4 indicates a decrease in extensions and revisions, in production, and in discoveries from the previous year. Production declined from 192 million barrels to 186 million barrels during 1977. Net reserves at year's end had declined from 1,466 million barrels to 1,293 million barrels, a reserves-production ratio of 6.95.

Oklahoma had 56,239 stripper wells, which produced 151,414,000 barrels of oil in 1977, according to the *National Stripper Wells Survey* (January 1, 1978). A stripper well, for the purposes of this survey, is a well producing 10 barrels of oil per day or less during the year under consideration. This survey listed average daily production from stripper wells as 3.62 barrels per day.

TABLE 3.—CUMULATIVE (THROUGH 1955) AND YEARLY (1956–77) MARKETED PRODUCTION AND VALUE OF PETROLEUM, NATURAL GAS, NATURAL GASOLINE, AND LIQUEFIED PETROLEUM GAS IN OKLAHOMA[1]

YEAR	CRUDE PETROLEUM		NATURAL GAS		NATURAL GASOLINE AND CYCLE PRODUCTS		LIQUEFIED PETROLEUM GAS	
	VOLUME (1,000 BBLS)	VALUE ($1,000)	VOLUME (MMCF)	VALUE ($1,000)	VOLUME (1,000 GALS)	VALUE ($1,000)	VOLUME (1,000 GALS)	VALUE ($1,000)
Through 1955	7,230,010	11,443,269	12,977,332	1,378,370	14,420,482	890,729	3,673,364	120,097
1956	215,862	600,096	678,603	54,288	489,963	26,543	579,101	23,427
1957	214,661	650,423	719,794	59,743	460,644	25,329	587,140	21,824
1958	200,699	594,069	696,504	70,347	440,798	26,029	657,114	25,822
1959	198,090	578,423	811,508	81,151	448,353	29,443	675,869	27,070
1960	192,913	563,306	824,266	98,088	531,995	33,074	762,258	32,409
1961	193,081	561,866	892,697	108,016	521,237	33,358	817,082	30,141
1962	202,732	591,977	1,060,717	135,772	552,795	35,764	838,903	25,223
1963	201,962	587,709	1,233,883	160,405	555,467	35,131	810,894	28,981
1964	202,524	587,320	1,323,390	166,747	554,053	34,011	880,804	28,055
1965	203,441	587,944	1,320,995	182,297	570,129	34,561	894,665	32,208
1966	224,839	654,281	1,351,225	189,172	576,124	35,715	968,254	44,381
1967	230,749	676,095	1,412,952	202,052	568,905	35,846	1,005,633	49,276
1968	223,623	668,202	1,390,884	197,506	584,010	38,829	1,070,874	39,520
1969	224,729	701,155	1,523,715	223,128	614,082	38,931	1,146,768	34,403
1970	223,574	712,419	1,594,943	248,811	622,146	39,933	1,177,218	52,975
1971	213,312	725,610	1,684,260	273,945	595,854	40,856	1,156,680	56,732
1972	207,633	709,033	1,806,887	294,523	611,478	42,709	1,140,216	57,101
1973	191,204	723,273	1,770,980	334,110	616,308	49,070	1,219,848	95,264
1974	177,785	1,277,076	1,638,492	458,904	528,402	84,638	1,311,702	166,461
1975	163,123	1,389,164	1,605,410	513,731	436,170	63,338	1,244,880	140,197
1976	161,426	1,484,297	1,726,513	866,710	457,548	74,416	1,328,040	179,602
1977	151,390	1,504,817	1,824,710	1,452,683	462,462	85,855	1,316,238	231,770
Totals	11,649,362	28,571,824	41,870,660	7,750,499	26,219,405	1,834,108	25,263,545	1,542,939

[1] Preliminary figures for 1977.

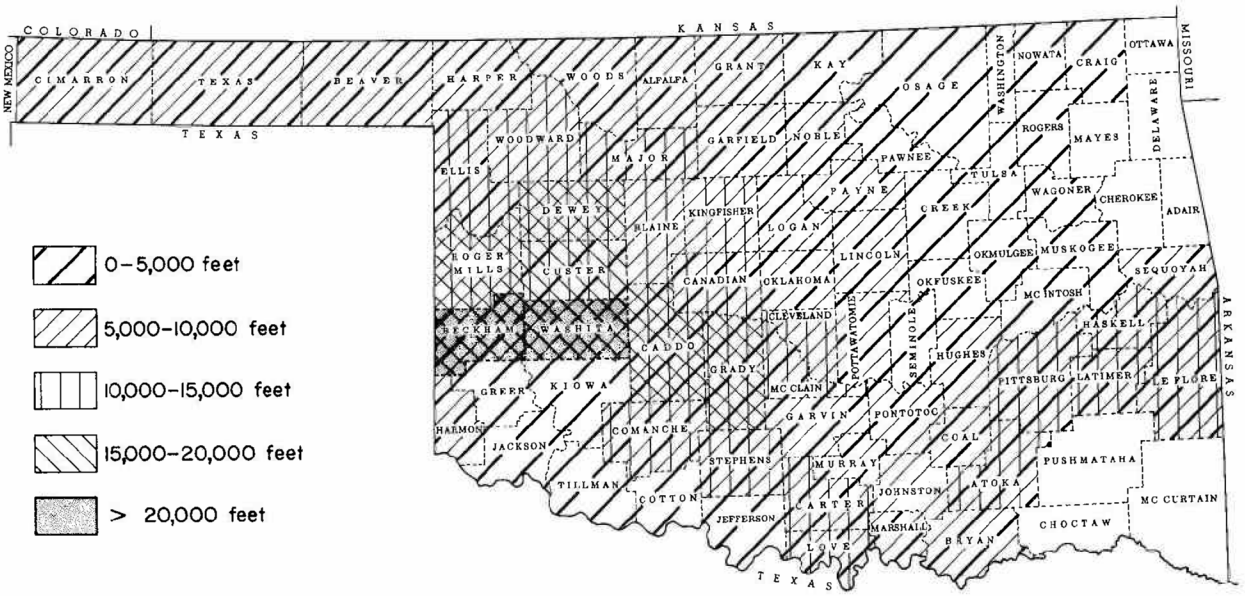


Figure 2. Map showing the 69 counties in Oklahoma that had exploratory and (or) development drilling activity in 1977. Counties are patterned according to the explanation showing drilling depths of the wells. The presence of a particular pattern in a county indicates that at least one well in that county was drilled to a depth corresponding to one of the five categories listed above. For example, Dewey County has three superimposed patterns to reflect wells drilled to three depth categories.

Table 5 shows completion and well-depth data. The number of deep wells declined slightly from recent years and is reflected in the average depth of wells drilled in the State.

Oklahoma continues to rank third in the nation in natural-gas production and fifth in oil production.

TABLE 4.—HYDROCARBON PRODUCTION IN OKLAHOMA

CRUDE OIL AND LEASE CONDENSATE	1976	1977
Total annual production (1,000 bbls)[1]	161,426	151,390
Value ($1,000)[1]	1,484,297	1,504,817
Cumulative production 1891-1977 (1,000 bbls)	11,497,972	11,649,362
Daily production (bbls)[2]	442,263	442,164
Total number of producing wells[2]	72,388	73,653
Daily average per well (bbls)	6.1	6.0
Oil wells on artificial lift (estimated)[2]	68,257	69,450
NATURAL GAS		
Total annual marketed production (MMCF)[1]	1,726,513	1,824,978
Value ($1,000)[1]	866,710	1,452,683
Total number of gas and gas-condensate wells[2]	10,293	11,512
NATURAL-GAS LIQUIDS		
Total annual marketed production (1,000 bbls)[1]	42,514	42,350
Value ($1,000)[1]	254,018	317,625

[1]1976 data are U.S. Bureau of Mines final figures; 1977 data are preliminary figures.

[2]World Oil, v. 186, no. 3, February 15, 1978.

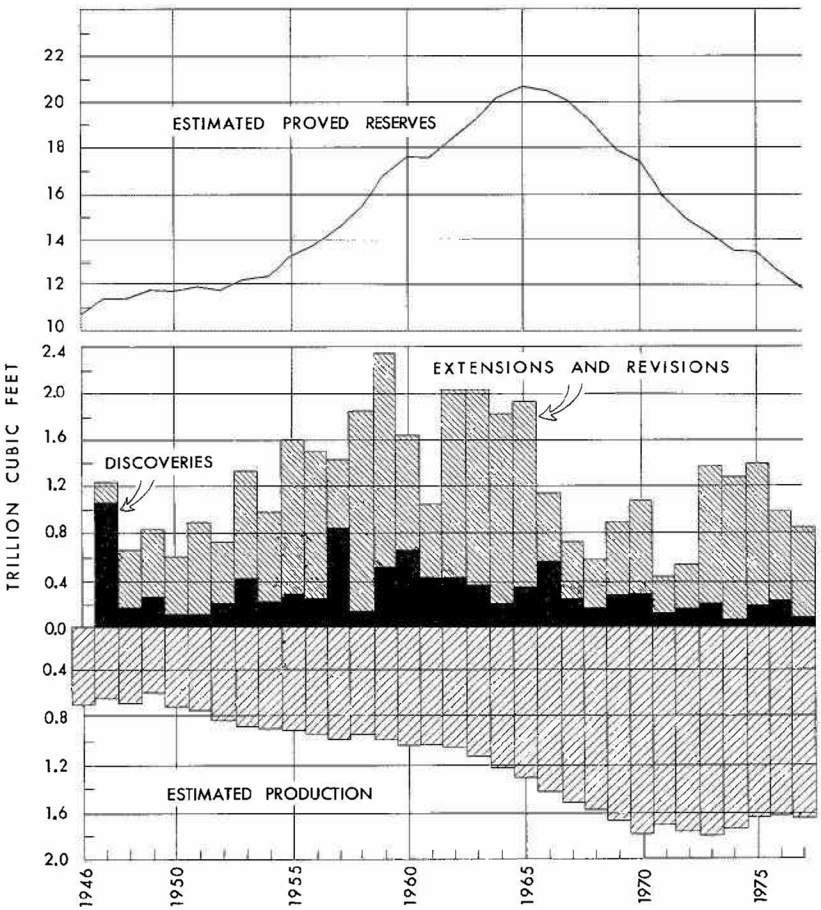


Figure 3. Graph showing statistics on estimated proved reserves of natural gas in Oklahoma, 1946-77 (source: American Gas Association, annual reports).

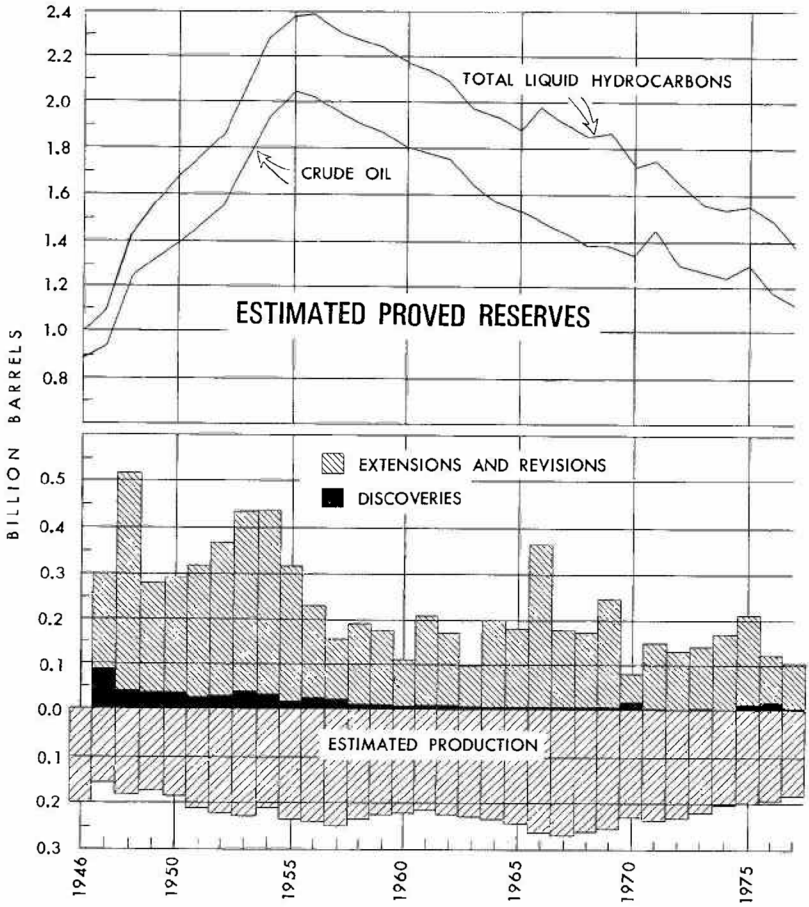


Figure 4. Graph showing statistics on estimated proved reserves of total liquid hydrocarbons in Oklahoma, 1946-77 (source: American Petroleum Institute, annual reports).

TABLE 5.—COMPLETION DATA AND DEPTH INFORMATION FOR WELLS DRILLED IN OKLAHOMA DURING 1977

(Source: American Petroleum Institute)

County	Total number of wells drilled	Completions gas	Completions oil	Percent completions (gas & oil)	Number of wells drilled in the following total-depth ranges (in feet):[1] 0-5,000	5,000-10,000	10,000-15,000	15,000-20,000	>20,000
Alfalfa	52	16	25	79	3	48	0	0	0
Atoka	5	0	0	0	3	1	1	0	0
Beaver	144	60	36	67	6	130	0	0	0
Beckham	19	8	0	42	8	2	0	6	3
Blaine	87	44	11	63	0	45	40	0	0
Bryan	2	0	0	0	1	1	0	0	0
Caddo	105	27	40	64	17	5	79	1	0
Canadian	172	101	45	84	1	115	53	0	0
Carter	83	6	52	70	36	43	2	0	0
Cimarron	18	7	2	50	14	3	0	0	0
Cleveland	25	1	6	28	0	23	1	0	0
Coal	32	20	3	72	13	19	0	0	0
Comanche	30	7	11	60	25	3	1	0	1
Cotton	39	0	23	59	39	0	0	0	0
Craig	28	20	1	75	28	0	0	0	0
Creek	108	2	77	73	108	0	0	0	0
Custer	34	20	7	79	1	0	28	5	0
Dewey	105	36	31	64	0	74	25	5	0
Ellis	95	18	40	61	1	66	27	0	0
Garfield	216	31	159	88	17	197	0	0	0
Garvin	81	7	33	49	52	28	0	0	0
Grady	71	21	17	54	8	6	51	5	0
Grant	50	6	11	34	23	27	0	0	0
Greer	73	0	67	92	73	0	0	0	0
Harmon	5	0	0	0	3	2	0	0	0
Harper	69	26	8	49	3	65	0	0	0
Haskell	30	12	1	43	9	20	1	0	0
Hughes	81	36	15	63	75	6	0	0	0
Jackson	3	1	0	33	3	0	0	0	0
Jefferson	28	1	13	50	27	0	0	0	0
Johnston	3	0	1	33	0	3	0	0	0
Kay	63	19	22	65	60	0	0	0	0
Kingfisher	103	11	80	88	0	102	1	0	0
Kiowa	22	1	8	41	21	0	0	0	0
Latimer	11	3	0	27	1	4	6	0	0
Le Flore	23	13	0	57	2	15	5	0	0
Lincoln	58	6	24	52	53	5	0	0	0
Logan	179	14	133	82	21	154	0	0	0
Love	26	0	12	46	20	5	1	0	0
McClain	44	0	24	55	12	23	9	0	0
McIntosh	35	24	1	71	35	0	0	0	0
Major	153	58	82	92	1	136	10	0	0
Marshall	16	3	6	56	9	7	0	0	0
Murray	23	1	7	35	22	1	0	0	0
Muskogee	36	7	16	64	36	0	0	0	0
Noble	101	5	35	39	67	33	0	0	0
Nowata	177	13	147	90	177	0	0	0	0
Okfuskee	45	13	11	53	45	0	0	0	0
Oklahoma	26	1	8	35	4	22	0	0	0
Okmulgee	154	50	56	69	154	0	0	0	0
Osage	561	23	378	71	559	0	0	0	0
Pawnee	42	1	20	50	41	0	0	0	0
Payne	82	2	39	50	75	6	0	0	0
Pittsburg	80	52	1	66	58	20	2	0	0
Pontotoc	48	0	29	60	47	1	0	0	0
Pottawatomie	87	3	38	47	54	32	0	0	0
Roger Mills	43	28	2	70	0	6	14	22	0
Rogers	56	4	42	82	56	0	0	0	0
Seminole	71	3	41	62	69	0	0	0	0
Sequoyah	7	5	0	71	2	4	0	0	0
Stevens	217	25	150	81	180	29	5	0	0
Texas	86	36	15	59	23	63	0	0	0
Tillman	3	0	0	0	3	0	0	0	0
Tulsa	61	4	38	69	61	0	0	0	0
Wagoner	31	1	11	39	31	0	0	0	0
Washington	100	0	93	93	100	0	0	0	0
Washita	5	0	0	0	0	1	0	1	1
Woods	78	31	8	50	6	69	0	0	0
Woodward	93	8	31	42	0	80	11	0	0
Totals	4,939	1,092	2,253	68 (avg.)					

[1] List does not include re-entry wells that have been drilled deeper.

OKLAHOMA CITY FIELD PASSES HALF-CENTURY MARK

Just 50 years ago this month, on December 4, 1928, the discovery well of the Oklahoma City Oil Field was completed when Indian Territory Illuminating Oil Co.–Foster Petroleum Corp. 1 Oklahoma City came in as a gusher. A few prior developments, however, had led up to this momentous event.

Oklahoma Geological Survey Bulletin 19, Part II, covering petroleum and natural-gas development in Oklahoma, prepared in 1916 by C. W. Shannon, director, and other staff members, including G. E. Burton, assistant director, Fritz Aurin, and C. W. Honess, lists six wells drilled in Oklahoma County (Shannon and others, 1917). All these wells were wildcats, located by guess and not by geologic methods. All were nonproductive, although some had shows of oil. Some shallower attempts had been made (see Rister, 1949, p. 249), but the first well of logged record that exceeded 500 feet was drilled in 1903 by a group led by an Oklahoma City hardware man, E. J. Streeter. It went to a depth of 2,002 feet, ending in "hard shale" after penetrating "red rock," sands, shales, "coal blossom," "lime shells," etc. The authors of the OGS bulletin stated that "Oklahoma County lies in probable oil and gas territory," which was a safe and prophetic conclusion.

It was George D. Morgan, probably in 1917, and Jerry B. Newby, in 1919, who first worked out the surface structure in and near Oklahoma City geologically (Travis, 1930). In 1920 or 1921, L. E. Trout and others prepared a structure map of what was to become the Oklahoma City Field. A well staked by Trout just north of Cleveland County in 1925 was drilled to 4,480 feet and showed traces of oil. Also in 1925, a deep test was drilled north of the State Capitol to 7,180 feet on the basis of a surface structure map prepared by John R. Bunn and John E. Van Dall. What it yielded was oil shows in shallow sands and water from the Middle Ordovician "Wilcox" sand (McGee and Clawson, 1932). A well drilled a mile north of the present Oklahoma City Field in 1926 by Cromwell Oil and Gas Co. was a producer, the first near Oklahoma City (Rister, 1949, p. 250).

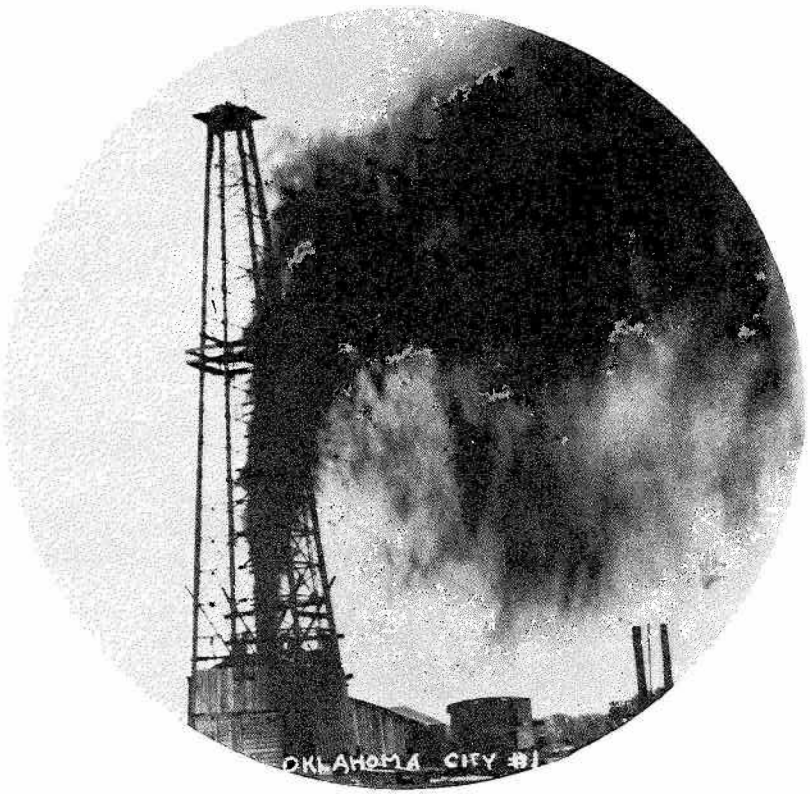
But it was Gustavus E. Anderson whose work was responsible for the staking of the discovery well in the Oklahoma City Field proper. Dr. Anderson, a native of Sweden, was a professor in the Department of Geology at The University of Oklahoma and one of the most highly respected men on campus. In the summer of 1927, while working as a consultant for Indian Territory Illuminating Oil Co. (ITIO), he discovered a southward-projecting nose in the Garber-Hennessey contact south and east of Oklahoma City and so stated in a report prepared for the company. This structure is obvious in a map prepared by Abe Travis (Travis, 1930, pl. 1).

ITIO had this and adjacent areas mapped by its geological department, leased 10,000 acres on the basis of the structure, located a well in the SE¼SE¼ sec. 24, T. 11N., R. 3 W., on land purchased from Mrs. Celia Hall, began drilling in June 1928 together with Foster Petroleum Corp., drilled into rocks of the

Arbuckle Group (Ordovician) at 6,165 feet, drilled farther to 6,402 feet, set casing at 6,355 feet, drilled out the plug, and the rest became history. The tools were blown up the hole and got stuck, but they didn't have to do much fishing for them. They came up with a great roar and a great fountain of oil. People shot off a cannon to celebrate.

December 4, 1928: 2,895 barrels of oil in the first 14 hours, accelerating to more than 6,000 barrels per day; 6,500,000 cubic feet of gas the first day. The well produced 1,002,887 barrels of oil from the Arbuckle eventually; and later, after plugging back to the Pennsylvanian Layton sand, the well became a prolific gas producer.

That was the beginning, and the Oklahoma City Field is now 50 years old and still going strong. Cumulative production figures through 1977 (*Oil and Gas Journal*, 1978) show 735,748,000 barrels; 1977 production amounted to 1,542,000 barrels from 223 wells. Truly a giant field.



ITIO-Foster Petroleum Corp. 1 Oklahoma City blows in December 4, 1928. (Photo courtesy of Western History Collection, University of Oklahoma Library.)

Not only has the Oklahoma City Field yielded vast amounts of oil and natural gas, but after its initial heyday, and after some strenuous opposition and stormy times (Rister, 1949), it became a model of orderly production. The field is unique in several ways, and it has been a proving ground for innovative technology (see Gatewood, 1970, p. 224).

This is a golden anniversary worthy of celebration. Perhaps we should shoot off another cannon.

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—*Elizabeth A. Ham*

VOLUME ISSUED ON PETROLEUM EXPLORATION

A recent book on petroleum exploration should be of considerable interest to those working in non-geological phases of the petroleum industry. Termed *Landman's Handbook on Petroleum Exploration*, the book is a practical guide for anyone seeking an understandable summary of this subject.

Author Suzanne Takken, a well-known Oklahoma City consulting geologist, states in the Introduction that the handbook evolved from a series of lectures she had given at The University of Oklahoma on exploration techniques for petroleum landmen. Although geology is emphasized more than geophysics, a comprehensive chapter on well logging by E. W. (Bill) Sengel has been incorporated, and other geophysical techniques have been touched on.

The well-organized handbook gives a good overall look at various geological methods that are commonly used in petroleum exploration. These are presented clearly in a straightforward manner, with examples from several producing fields in the United States.

Following the introductory chapter, there is a chapter that defines and illustrates basic geological terms. Another chapter treats various exploration methods. Surface and subsurface mapping methods are explained, and a later chapter discusses cross sections. The book's final chapter is a practical consideration of what to look for in a geological prospect, including analyses of risks, reserves, and general economics.

Adding to the usefulness of the handbook is a series of appendixes covering such topics as sources of geological information, general reference publications, and calculations for recoverable oil and recoverable gas. An index is also provided.

The 172-page handbook, published by The Institute for Energy Development in Fort Worth, is presented in an attractive 6- by 9-inch, 1-column format. It can be ordered from Metro Media, Ltd., 1329 Classen Drive, Oklahoma City, Oklahoma 73103. The cost is $14.00 for paperbound and $22.00 for hardbound copies.

—*William D. Rose*

Aerial Survey Includes Oklahoma Quadrangles

A report in two volumes covering 29,059 line miles of a fixed-wing aerial geophysical survey of 14 National Topographic Map Series (NTMS) 1:250,000-scale, 2° quadrangles in Oklahoma and seven other states has been placed on open file by the Grand Junction, Colorado, office of the U.S. Department of Energy.

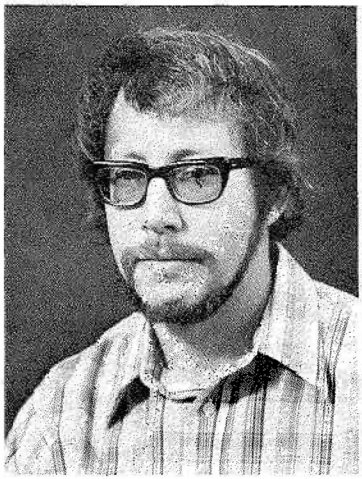
The survey, carried out as a part of the National Uranium Resource Evaluation (NURE) program by Texas Instruments, Inc., Dallas, Texas, during July-October 1977, also covers quadrangles in South Dakota, Iowa, Nebraska, Colorado, Kansas, Arkansas, and Missouri.

Volume 1 of the final report includes sections on instrumentation, survey and instrumentation methods, a summary of the interpretation for all 14 quadrangles, and listings of microfiche data for all the quadrangles.

Volume 2 contains sections on geology and radiometric interpretation as well as statistical summary tables; record locations and geologic maps; radiometric profiles for potassium, uranium, and thorium and their ratios; anomaly (profile) maps; and histograms for each geologic unit. All maps and profiles are at a scale of 1:500,000.

The report, GJBX-100(78), *Aerial Radiometric and Magnetic Reconnaissance of a Portion of the Great Plains and Central Lowlands*, is on file at the Oklahoma Geological Survey for inspection. The report is available on microfiche from the DOE's Grand Junction office for $75. Checks should be made payable to Bendix Field Engineering Corp., the operating contractor.

Geologist and Chemist Join OGS Staff



Salman Bloch

Stephen J. Weber

A uranium geologist and an analytical chemist recently joined the staff of the Oklahoma Geological Survey.

Salman Bloch holds a newly created position as a geologist in uranium-resource investigations. He is currently engaged in field examinations of uranium deposits in the Clinton and Enid 2° quadrangles of west-central and north-central Oklahoma. The area under reconnaissance covers approximately one-sixth of the State and was designated for exploration because of known occurrences of uranium-bearing rocks in both surface exposures and subsurface strata.

The project is sponsored by the U.S. Department of Energy (DOE) as part of Oklahoma's contribution to DOE's National Uranium Resource Evaluation (NURE) program. Work done by Bloch and by Kenneth S. Johnson, OGS geologist and associate director, who is principal investigator for the grant project, is designed to coordinate and supplement previous uranium-resource assessments in Oklahoma.

Bloch, a native of Poland, received his M.S. degree from Wroclaw (Breslau) University in 1968 and was awarded a Ph.D. in 1977 from The George Washington University, where he served as a graduate teaching fellow. Before joining the OGS staff he had been employed as a uranium geologist with Geoexplorers International in Denver, conducting an evaluation of the uranium potential of southwestern Montana. Prior to that, he served as a geologist on a part-time basis with the U.S. Geological Survey, working on projects to investigate the geology of the Arabian Shield and the metallogeny of the northeastern part of the circum-Pacific area. He participated in an oceanographic cruise of the U.S.

Coast Guard Cutter *Edisto* for the Naval Oceanographic Office, analyzing water in the North Greenland Sea and working up data acquired. Sal also served as assistant editor for the American Geological Institute (AGI), abstracting and indexing Polish, German, Russian, and English-language earth-science literature and coediting the *Bibliography and Index of Geology*. Before coming to this country he worked on the Permian-age Kupferschiefer deposits in the Sudeten Mountains and the Fore-Sudeten Monocline.

His chief interests lie in low-temperature geochemistry, the geochemistry of uranium, ores in sedimentary rocks, metalliferous marine sediments, and geochemical budgets of elements in the ocean; and he has published several papers on these subjects. He is a member of The Geological Society of America and the Geological Society of Washington.

Salman's wife, Janina, is also a geologist. She earned an M.S. degree in geology from Wroclaw University and worked for the Polish Geological Survey. In the United States she has been employed by AGI to translate and abstract articles from Polish, Russian, and other Slavic-language journals for GeoRef, the AGI data bank, and also to perform computer retrievals of geologic information for GeoRef clients. Continuing this work, she serves now as a consultant for AGI. Janina, too, is a member of the Geological Society of Washington.

Stephen J. Weber has joined the staff as the Survey's new analytical chemist, replacing David A. Foster, who served in this capacity from July 1971 until August of this year. Dave is currently working at the U.S. Environmental Protection Agency's Robert S. Kerr Research Laboratory in Ada, Oklahoma, on a grant project that is administered through the Oklahoma Geological Survey.

Steve received his B.S. degree in chemistry from the University of Houston in June 1969 and an M.S. degree in environmental science in August 1970 from the same university. He did graduate work toward a Ph.D. in environmental chemistry in 1972 and 1973 at the University of Maryland, where he served as a teaching assistant and also as a research assistant in power-plant-stack sampling.

He came to the OGS from a position as a laboratory quality-control supervisor for pesticide production for Vicksburg Chemical Co. at Vicksburg, Mississippi. Earlier appointments were with several industrial corporations, where his work included setting up a laboratory for monitoring effluents from petroleum refining, supervising fuel-quality testing, wastewater and solid-waste management, conducting water-quality and air-quality surveys, and monitoring air and water pollution. He has published on ion electrode measurements as related to industrial wastes. He is a member of the American Chemical Society, Division of Environmental Chemistry and Division of Analytical Chemistry, and of the Water Pollution Control Federation.

Steve's work with the Survey has involved analyses of Oklahoma coal samples, Oklahoma mineral samples, Oklahoma water samples, and Standard Reference water samples.

The project of analyzing Oklahoma water is being undertaken in cooperation with the Oklahoma City regional office of the Water Resources Division of the U.S. Geological Survey. Results will be incorporated as Oklahoma's part of the National Water Data System.

The Standard Reference water samples are prepared specimens of known chemical content that have been supplied by the USGS Water Resources Division in Denver. This project of analysis is being conducted under the Analytical Evaluation Program, which was formulated to provide an independent, objective evaluation of water-quality data published by the federal survey and other cooperating agencies. The standards established under this program will serve as a frame of reference for classifying water from all parts of the country.

Steve plans to develop new analytical methods as needed to perform the required testing. This will necessitate the acquisition of some new equipment and facilities for the OGS chemical laboratories.

Steve and his wife, Jane, have a son, Mark, who is 9 years old, and a daughter, Tracy, 5. Steve is certain that the children are both "future Nobel Prize winners." Jane has a B.S. degree in analytical chemistry also and has been employed most recently with the Environmental Effects Laboratory of the U.S. Army Corps of Engineers in Vicksburg.

We welcome the Blochs and the Webers to Norman and to the Oklahoma Geological Survey.

Oklahoma Mineral Report Published

A new publication prepared by the U.S. Bureau of Mines (USBM) in cooperation with the Oklahoma Geological Survey provides information on State mineral production and the mining industry for 1977. Issued by USBM as SMP (State Mineral Profiles) 48, *Minerals in the Economy of Oklahoma* was authored by Robert H. Arndt, State liaison officer with the Bureau of Mines, and Charles J. Mankin, OGS director.

This 24-page volume represents Oklahoma's contribution to a new, individual, state-by-state series initiated in 1977 for purposes of making the data contained available more quickly and of offering broader coverage of the mineral industries than has been possible heretofore. Because of the magnitude of the project, assembled statistics published annually in the USBM *Minerals Yearbook* have covered mineral information that applies to production two or three years before the date of publication. These State Mineral Profiles will be issued annually in the future.

SMP-48 shows a record-high value of $3.5 billion for raw materials produced in Oklahoma in 1977, with 96 percent of the total derived from fossil fuels. It points out that gains in value must be considered in the light of a great increase in unit value of petroleum and natural gas and that although the value of petroleum and natural gas increased 1.4 percent over the preceding year, production of crude actually decreased 29 percent. Value of produced natural gas increased 68 percent, but production increased less than 6 percent.

Coal production reached an all-time high in 1977 of 5.3 million short tons, a 47-percent increase over 1976 production; and the value was 50 percent greater than in 1976. The first coal-fired power-generating plant was in operation, and

five others were under construction, all designed to burn Wyoming coal. All cement plants burned Oklahoma coal.

Most metallic and nonmetallic minerals increased in both value and production. Cement had the largest total product among non-fuel mineral commodities, and sand and gravel were second in tonnage produced and third in total value. Oklahoma was fifth among the states in gypsum production. Only clays, crude helium, liquefied petroleum gases, lime, salt, and tripoli varied from the dual upward trend in production and value.

This book should be of value not only in providing statistical data but in offering analyses and discussion of the status of mineral industries, economics, legislation, employment, transportation, federal and State programs, and trends.

USBM SMP-48 can be obtained on request from Publications Distribution Branch, U.S. Bureau of Mines, 4800 Forbes Avenue, Pittsburgh, Pennsylvania 15313. A limited number of single copies are available at the Oklahoma Geological Survey, 830 Van Vleet Oval, Norman, Oklahoma 73019. There is no charge.

State Receives Two Grants for Surface-Mining Programs

Oklahoma has recently received two federal grants totaling more than $300,000 to develop enforcement and regulatory programs under the Surface Mining Control and Reclamation Act of 1977.

A grant of $121,182 will be used for additional costs incurred in administering and enforcing the initial regulatory program under the new federal law that was passed to alleviate the harmful effects of coal-mining operations.

The second grant of $205,462 will be used to develop inspection, monitoring, and enforcement provisions for Oklahoma's proposed permanent regulatory program.

The 1977 act is administered by the U.S. Department of the Interior's Office of Surface Mining. The grants will be handled by Oklahoma's Department of Mines.

The first grant will pay for costs exceeding the State's $49,050 base program for enforcing the initial regulations. The grant will cover up to 100 percent of these excess costs. The grant will be used for revision of State regulations to further its enforcement program and for addition of new equipment and technical services needed to implement the program. The grant will also permit the Oklahoma Department of Mines to double its staff, hiring an additional 14 persons, including three inspectors.

The second grant provides 80 percent of the estimated expenses for the first year of the permanent program. Portions of the grant will be used to revise permitting, reclamation, and other procedures; to develop a planning process for designating lands unsuitable for coal mining; to provide computer

services for permitting data; and to provide technical training for State inspectors.

In 1970, more than 2.4 million tons of coal was surface-mined in Oklahoma; and last year, 5,346,654 tons was taken from approximately 3,000 acres being mined. More than 870 persons currently are employed in Oklahoma's coal-mining industry.

DOE Issues Reports on 1950's Uranium Studies

The U.S. Department of Energy has recently placed on open file 117 reports resulting from uranium investigations carried out in the 1950's by the U.S. Geological Survey for the U.S. Atomic Energy Commission. These reports cover areas throughout the nation and have been issued to assist the public in evaluating areas that might be favorable for the occurrence of uranium.

Single copies of the reports can be inspected at the Oklahoma Geological Survey. Information about microfiche copies of the reports can be obtained by writing DOE's office in Grand Junction, Colorado.

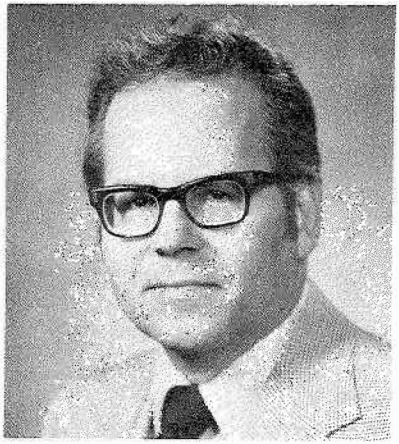
Although Oklahoma has not been covered by any of the reports, areas in several neighboring states have been assessed; most are in Colorado (37) and New Mexico (7), while Texas and Arkansas have one each.

OKLAHOMA APGS MEMBERS MEET IN OKLAHOMA CITY

Members and guests of the Oklahoma Section of the Association of Professional Geological Scientists convened for their annual meeting October 20 and 21 at the Holiday Inn East in Midwest City (metropolitan Oklahoma City area). The meeting was presided over by the section president, John S. Fryberger.

At a dinner meeting October 20, A. A. Meyerhoff, well-known Tulsa geologist and former publications manager for The American Association of Petroleum Geologists, spoke from his viewpoint as a petroleum consultant to the governments of the U.S.S.R., People's Republic of China, Mexico, and other countries. Many of his insights into petroleum geopolitics were startling and sobering to the audience.

He reported that the Soviet Union's obvious asset of a vast resource base of petroleum and natural gas was counterbalanced by the lack of viable technology for effective development of these resources, a result in large part of the country's political system. The United States has a significant advantage, he pointed out, in its superior technology, which appears to be decades ahead



Wilgus B. Creath

of that of the major Communist nations. He said that we Americans have the opportunity to put this technological edge to good use right now by developing our oil-shale resources and by working toward breakthroughs in alternate energy sources while we still have sufficient petroleum supplies to carry us for the short term.

An all-day session October 21 began with a summary by Kenneth S. Johnson, associate director of the Oklahoma Geological Survey, of current geological investigations in Oklahoma by the Survey and other governmental agencies.

Frosty Troy, editor of *The Oklahoma Observer*, added zest to the luncheon fare through his perceptive and witty view of Oklahoma's political scene.

Other speakers included Grover E. Murray, national APGS president; John P. Klingstedt, professor of accounting at The University of Oklahoma; John A. Taylor, national past president of APGS and an Oklahoma City consultant; and Billy Crynes, a researcher in coal liquefaction and gasification at Oklahoma State University.

The section's annual business meeting wound up the session's activities. A new set of section bylaws was adopted, and various committee reports were given.

New section officers were introduced, as follows: president, Wilgus B. Creath, consultant; first vice-president and president-elect, Gary A. McDaniel, consultant; second vice-president, Don E. Brown, independent; and secretary-treasurer, Gary F. Stewart, Oklahoma State University. New section district representatives are Robert L. Isaac (Oklahoma City), Texas Pacific Oil Co.; Fred J. Wagner, Jr. (Tulsa), Getty Oil Co.; and Louis R. Reeder, consultant, Tulsa, representative-at-large.

—*William D. Rose*

OKLAHOMA ABSTRACTS

American Geophysical Union, Midwest Meeting St. Louis, Missouri, September 25-27, 1978

The following abstracts are reprinted from the *Abstracts* of the American Geophysical Union, Midwest Meeting, 1978. Page numbers are given in brackets below each abstract. Permission of the authors and Judy C. Holoviak, Publications Manager, to reproduce the abstract is gratefully acknowledged.

Operation of a Statewide Seismic Network without Telemetry Costs

JAMES E. LAWSON, Oklahoma Geophysical Observatory, Oklahoma Geological Survey, Leonard, Oklahoma

The Oklahoma Geophysical Observatory field stations are operated on a continuous basis by volunteers without technical backgrounds. After about 4 hours' training—spread over two days' time—volunteers are careful and accurate in changing and labeling records and correcting the timing system. Direct recording of WWV ticks and second ticks at the beginning of each record assures that their time corrections are accurate to 17 milliseconds. Volunteers are found by contacting random individuals in a target area.

The volunteer network has several advantages over telephone telemetry, in addition to very low cost. A station can start continuous operation as early as 48 to 96 hours after the target area is selected. The reliability of recording (averaging 360 days/year) may exceed telemetry reliability, and the volunteer stations require few maintenance calls. [11]

Aspects of Paleomagnetic Studies for Mid-Continent Regions

ROB VAN DER VOO and DOYLE R. WATTS, Department of Geology and Mineralogy, University of Michigan, Ann Arbor, Michigan; WILLIAM LOWRIE and FRIEDRICH HELLER, Institut für Geophysik ETH-Hönggerberg, CH-8093, Switzerland

The Mid-continent region of the U.S., bounded on three sides by the Appalachian-Ouachita-Marathon foldbelt and the Rocky Mountains, consists of essentially flatlying Paleozoic and Mesozoic platform deposits with occasionally Precambrian rocks exposed in uplifts (e.g., Llano, Ozarks, Lake Superior region). A fair amount of paleomagnetic studies have been published or are in progress, but mostly on the more strongly magnetic Precambrian igneous rocks

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OKLAHOMA ABSTRACTS is intended to present abstracts of recent unpublished papers relating to the geology of Oklahoma and adjacent areas of interest. The editors are therefore interested in obtaining abstracts of formally presented or approved documents, such as dissertations, theses, and papers presented at professional meetings, that have not yet been published.

or on Paleozoic and Precambrian clastic sediments of this region. If further paleomagnetic work on new Mid-continent formations is contemplated, one inevitably is faced with the problems related to the paleomagnetic study of carbonate rocks, particularly for a detailed determination of the Paleozoic segment of the North American apparent polar-wander path. The problems with such studies are manifold: these shallow-water deposits are very weakly magnetic, the strata are generally flatlying and as a result no foldtest is possible as a check on complete remagnetizations of the carbonates (as can be and have been demonstrated for some Paleozoic carbonates in the folded regions of the Black Hills, the Ouachitas and the Appalachians). Thus, essential for these studies is a very sensitive (cryogenic) magnetometer, careful analysis of the magnetic stability and rock-magnetic properties, determinations of the carriers of the remanence, and a calibration against other paleomagnetic poles (with the danger of circular reasoning). Some examples of recent paleomagnetic work on limestones by the authors will be given to illustrate this. [6]

American Quaternary Association, 5th Biennial Meeting Edmonton, Alberta, Canada, September 2-4, 1978

The following abstract is reprinted from the *Abstracts* of the American Quaternary Association, 5th biennial meeting, 1978. Page number is given in brackets below the abstract. Permission of the author to reproduce the abstract is gratefully acknowledged.

Late Holocene Alluvial Chronology from Northeastern Oklahoma

STEPHEN A. HALL, Department of Geography and Institute of Applied Sciences, North Texas State University, Denton, Texas

A 2,000-year sequence of alluviation, channel cutting, and soil development in the Little Caney River valley parallels similar geologic histories of other areas. The main valley fill is a mottled yellow silty clay, radiocarbon dated 1,981 ± 75 years B.P. at a low horizon. A 1-meter thick noncalcareous dark-grayish-brown paleosol, interpreted as an aggrading flood-plain soil, occurs at the top of the 2,000-year old alluvial clay. Humates from the upper part of the paleosol are dated 1,330 ± 85 years B.P. A similar paleosol, as yet undated, occurs in a number of young flood-plain deposits in Oklahoma and Texas. Paleosol development terminated with incision of the flood plain. Sediments filling the old channel and deposited on top of the paleosol are dated 848 ± 62 years B.P. The episode of channel cutting is thus dated between 850 and 1,300 years ago and may be the same channel cutting event documented on the Lower Pomme de Terre in Missouri and represented by the post-Bonito channel in New Mexico and elsewhere in the Southwest. A weakly developed soil occurs above the 850-year horizon; an even less well developed soil occurs at the present flood-plain surface. The flood plain is incised 6 meters by the present channel, typical of stream valleys in the Southern Plains. Although probably historic in age, the exact period of channeling varies from valley to valley. [207]

Gulf Coast Association of Geological Societies
Gulf Coast Section SEPM 28th Annual Meeting
New Orleans, Louisiana, October 11-13, 1978

The following abstracts are reprinted from the September 1978 issue, v. 62, of the *Bulletin* of the American Association of Petroleum Geologists. Page numbers are given in brackets below each abstract. Permission of the authors and of Ira A. Lutsey, AAPG publications manager, to reproduce the abstracts is gratefully acknowledged.

Sedimentary Facies, Structures, and Grain-Size Distribution—Red River in Oklahoma and Texas

DANIEL E. SCHWARTZ, Programs in Geosciences, University of Texas at Dallas, Richardson, Texas

The braided-to-meandering transition zone of the Red River in Oklahoma and Texas consists of four principal facies (channel-bar, point-bar, flood-flat, and flood-plain) and two subfacies (the point-bar facies is divided into sheet-flow and channel-flow point-bar subfacies). Each facies and subfacies contains an assemblage of sedimentary structures which occur in response to the varying discharge regime of this sand-bed stream. The channel-bar facies is characterized by fine-grained sand and a predominance of Pi- and Gamma-cross-stratification, plane-bed stratification, and scouring surfaces. Medium-grained sand with Epsilon- and Pi-cross-stratification, plane-bed stratification, and sand-filled mud cracks characterize the sheet-flow point-bar subfacies, whereas Pi-, Beta-, and Nu-cross-stratification and soft-sediment faulting in fine-grained sand characterize the channel-flow point-bar subfacies. Medium-grained sand with Pi- and Gamma-cross-stratification, plane-bed stratification, and scouring surfaces characterize the flood-flat facies; and very fine-grained sand, Pi-, Nu-, and Kappa-cross-stratification, mud cracks, desiccated mud beds, thick mud slabs, contorted bedding, and burrows characterize the flood-plain facies.

Grain-size distributions and sedimentary textural parameters of these facies and subfacies are distinctive, and can be used to differentiate them. Sediments of the flood-plain facies are fine-grained, fine-skewed, and poorly sorted, and channel-flow point-bar subfacies sediments are well sorted. Sediments of the channel-bar facies are fine-skewed, but sheet-flow point-bar subfacies and flood-flat facies sediments tend to be coarse-skewed. Mean grain size, standard deviation, and skewness are the most powerful discriminators. Scatter diagrams plotting these parameters display separations between the two point-bar subfacies, the flood-flat facies, and the flood-plain facies. Sediments of the channel-bar facies were scattered in all plots. Combining structural data with grain-size data is effective in separating transition-zone facies, and may be useful in analyzing ancient fluvial sand bodies. [1765–1766]

Peritidal Carbonate Material and Evidence for Vanished Evaporites in Lower Ordovician Cool Creek Formation, Arbuckle Mountains, Oklahoma

JACK W. ST. JOHN and DAVID E. EBY, Programs in Geosciences, University of Texas at Dallas, Richardson, Texas

Exposures of the Cool Creek Formation (Canadian Arbuckle Group) in southern Oklahoma reveal that these sediments were deposited in a hypersaline peritidal setting. The major rock types in this 400-m unit are: (1) flat-pebble conglomerates; (2) pelloidal wackestones, packstones, and grainstones; (3) oolitic packstones and grainstones; (4) thin, small-scale trough-stratified quartz sands; and, (5) stromatolitic boundstone. Digitate stromatolites predominate in the boundstone lithologies and are generally found as small circular to elongate heads, large mounds up to 2.5 m thick, and tabular beds. Thrombolites, cryptalgalaminites, and oncolites are also present but in smaller quantities. Most stromatolitic material contains abundant spar-filled tubules or borings that range in size from 40 to 200 μ and impart a spongy appearance which is visible with a hand lens.

Bedded and nodular evaporites are not present in outcrops but are known from the subsurface. However, evidence for their former presence is extensive. Chert nodules containing abundant molds and pseudomorphs after gypsum, anhydrite, and possibly halite are present. Distortion of the bedding surrounding these nodules, as well as disruption of interior textures, suggests that the evaporites grew displacively within the carbonate mud. All former evaporite nodules are partially to completely silicified as are most isolated evaporite pseudomorphs. This implies a remarkable selectivity of the chert for evaporites. Many detrital quartz grains in the evaporitic zones also have syntaxial euhedral quartz overgrowths. At least three 1- to 2-m thick breccias, interpreted to be of solution-collapse origin, are present in the Cool Creek. They consist of thin, broken beds of quartz-rich, reddish carbonate mud with abundant, thin microfaulted chert beds containing gypsum pseudomorphs and molds. Individual blocks range in size from 1 cm to 0.5 m in length. Other evidence of hypersaline conditions, such as restricted faunas, high-relief stromatolites, syndepositionally broken ooids, and length-slow chalcedony is less conclusive, but when combined with the breccias and chertified nodules, provides additional confirmation. Because the Cool Creek is known to contain evaporites in subsurface, it provides an excellent opportunity for the study of many of the various criteria which signal the former presence of now vanished evaporites. [1767]

Oklahoma State University

The Geothermal Gradient in Sedimentary Rocks in Oklahoma

PAUL KWONG-SHUN CHEUNG, Oklahoma State University, M.S. thesis, 1978

Scope and Method of Study: The main objective of this study was to construct a geothermal gradient map of Oklahoma, exclusive of the Panhandle, and

the Ozark and Ouachita Provinces. Subsurface temperature data from oil and gas operations were used to determine the geothermal gradient. Most of the temperature data were bottom-hole temperatures from well logs, and they do not represent true formation temperatures. A correction scheme was developed for these data by comparing the differences between bottom-hole temperatures and equilibrated temperatures as a function of depth. Near-surface temperature was established as a control point for constructing a linear gradient where temperature data are available only for a single depth. The near-surface temperature was determined by extrapolation of reliable temperatures at depth. Temperature gradients within an abnormally pressured zone were mapped separately. Mud-weight changes served as the indicators for abnormal pressure. A regional geothermal-gradient map and an abnormal-temperature-gradient map were constructed from the values determined for each township with control. Correlations were made between features of these maps and known geologic and geophysical features.

Findings and Conclusions: Bottom-hole temperatures, after correction, are useful in mapping geothermal gradients. Anadarko and Ardmore Basins show low thermal gradients, whereas the Arkoma Basin shows high gradients. The gradients appear to be related primarily to basement configuration and fluid migration for areas outside the Arkoma Basin. Features of the geothermal gradient maps correlate well with tectonic-structural features. A number of geothermal-gradient anomalies correlate with oil and gas accumulations; the best correlations involve abnormal gradients. Presence of an abnormally pressured zone at depth may result in lower gradients in overlying strata due to an insulating effect. Also, geothermal anomalies correlate quite well with geophysical anomalies.

The Subsurface Alteration and Mineralization of Permian Red Beds Overlying Several Oil Fields in Southern Oklahoma

JERRY DUANE FERGUSON, Oklahoma State University, M.S. thesis, 1977

Scope and Method of Study: Rotary-drill well cuttings were examined to delineate subsurface alteration zones around three oil fields in southern Oklahoma. Particular attention was given to variations in color and cementing materials. Diagenetic mineral occurrences were mapped to determine mineral zonations, and the locations of the zone boundaries. Mineralized zones were compared with productive areas and structural features within the fields to determine their relationships. Petrographic analyses were conducted on sandstones exhibiting diagenetic features.

Findings and Conclusions: Permian sandstones which are typically red are altered to white over the crests of the Velma, Eola, and Chickasha Anticlines. This color change is due to a change in cementing materials from clay, limonite, and hematite to calcite, dolomite, and in some places, pyrite over the anticlines. Bleaching and mineralization was restricted to sandstone and was brought about

by the reduction of iron oxides by hydrogen sulfide associated with petroleum and (or) generated by a reaction between hydrocarbons and sulfate ions. Hydrogen sulfide reacted with iron oxide to form pyrite and with oxygen to form sulfur. Pyrite cement occurs in zones that overlie pre-Permian faults, oil productive areas, and that are elongated along structural trends. Zone boundaries are sharp and nearly vertical. The average pyrite content of mineralized sandstones is 3 percent. Pyrite occurrences show that petroleum-bearing fluids were introduced into Permian rocks by vertical movement along high-angle normal and reverse faults that cut reservoirs at depth and intersect unconformities at the base of the Permian section.

Genesis and Trend of the Lowermost Unit of the Vamoosa Formation (Gypsy Sandstone) in Parts of Northeastern and Central Oklahoma

GARY WAYNE FORD, Oklahoma State University, M.S. thesis, 1978

Scope and Method of Study: Interpretation of trend and genesis of sandstone units in the interval of study was the main objective, which was accomplished by studying geometry and internal features of the units. Geometric data for preparation of thickness map were collected from subsurface thicknesses and outcrop measurements. Internal features were obtained from outcrop measurements. Source area for the Gypsy Sandstone was evaluated by using regional sandstone trends, paleocurrent data, maximum grain size, and clast composition.

Findings and Conclusions: Channel sandstones in the informally designated Gypsy Sandstone of the lower part of the Vamoosa Formation represent multistoried and multilateral, regressive alluvial sandstone bodies. The conglomeratic sandstones, consisting of chert clasts, quartzite clasts, breccia clasts, and coarse- to fine-grained sandstone, are characterized by festoon medium-scale crossbedding, cut-out, and initial dip. They are poorly- to moderately-sorted and exhibit abrupt vertical changes in grain size. These conglomeratic sandstones represent braided stream deposits on a piedmont plain that developed adjacent to the Ouachita uplift. As regressive conditions continued, an alluvial plain built by numerous meander belts, extended from the piedmont plain, over the rest of the study area. Channels on the alluvial plain probably obtained a maximum depth of 30 feet. These channel deposits are well sorted, coarse- to fine-grained quartzarenites characterized by medium-scale crossbedding, cut-out, high-angle initial dip, parting lineation, and overall paleocurrent direction between N25°W and N35°W. At one exposure, a crevasse splay deposit associated with a meandering stream contains upright *Calamites* stems. Well-sorted, very fine- to fine-grained thin-bedded sandstones represent shallow-marine and (or) coastal deposits. They contain medium-scale and small-scale crossbedding, ripple marks, parting lineation, initial dip, interstratification, fossils, and burrows. Paleocurrent data exhibit a primary trend of N75°W and a secondary direction of S45°W for the thin-bedded sandstones. Deposition of the Gypsy Sandstone was terminated by a minor marine transgression over the study area.

Structural Contour Map of Oklahoma on the Pennsylvanian Wapanucka Limestone, Oswego Limestone, Base of the Hoxbar Group, and Checkerboard Limestone

RICHARD DALE FRITZ, Oklahoma State University, M.S. thesis, 1978

Scope and Method of Study: Regional structural geology of Pennsylvanian strata of the platform and basinal areas of Oklahoma was determined through the correlation and mapping of four or more Pennsylvanian stratigraphic reference horizons. Data were derived from previously reported well data, electric and radioactive well logs, correlation sections and previous works. Determination was made of structural origin and history. Original maps were prepared at a local scale (1:63,360) and then reduced to a final regional scale (1:500,000).

Findings and Conclusions: Correlation across the Oklahoma platform indicates that two limestones are commonly regarded as the Oswego Limestone; the upper limestone is the Altamont Limestone Member of the Oologah Formation and the lower is the actual Oswego Limestone. Major north-northeast structural trends, and secondary east-west alignments present on the platform are fault-related and many hydrocarbon accumulations are associated with drape folding over linear uplifts or are at intersections of two trends. Many of the larger structures and structural trends on the platform are part of the Nemaha range or near it. Structures in the basinal areas are generally parallel to the basinal axes. Most structures of Oklahoma formed either during orogenic activity initiated during Late Pennsylvanian or by rejuvenation of older structures during that time. The larger structures are probably related to strike-slip movement; some of the other features are due to differential compaction. The larger Pennsylvanian structures commonly are reflected by paleogeological and geophysical parameters.

Subsurface Virgilian and Lower Permian Arkosic Facies, Wichita Uplift–Anadarko Basin, Oklahoma

CHARLES ALLAN HANSEN, Oklahoma State University, M.S. thesis, 1978

Scope and Method of Study: Electric logs, sample logs, and scout data were used to study the geometry, geographic distribution, depositional patterns, and sandstone percentage and thickness of arkosic facies in the relatively shallow subsurface. These strata were deposited in the Wichita Uplift–Anadarko Basin area of Oklahoma. Electric-log correlation sections and core samples were used to determine depositional environments. Thin sections and x-ray diffraction of selected core samples were used to determine diagenetic features. Anomalously high gamma-ray intensities were cataloged and related to gross facies, structure, and production of hydrocarbons.

Findings and Conclusions: Sandstone-conglomerate percentages in the arkosic section down to a depth of 5,000 feet range from zero to more than 70 percent. Sandstone-conglomerate thicknesses range from zero to more than 2,000 feet. Near the Wichita Uplift the maximum grain size is over 18 inches (450 mm). Arkosic facies deposited near the Wichita Uplift were siltstone-shale,

sandstone, conglomerate, and interbedded sandstone and siltstone-shale. These facies together compose fan-delta complexes which are composed of transgressive-regressive couplets containing, in ascending order, nearshore shallow-marine deposits, coastal delta-fringe or strandline deposits, alluvial-fan deposits, and reworked fan-delta deposits. Anomalously high gamma-ray intensities noted in some zones usually represent some combination of the following factors: high feldspar content, faulting, production of hydrocarbons, abundant carbonaceous material, and high porosity.

Petroleum Geology of the Misener Sandstone in Parts of Payne and Lincoln Counties, Oklahoma

JAMES P. KOCHICK, Oklahoma State University, M.S. thesis, 1978

Scope and Method of Study: Areal extent of the Misener sandstone was delineated by an isopachous map. Paleotopography of the pre-Woodford unconformity was described by an isopachous map of the interval from the top of the Woodford Shale to the base of the Woodford Shale or the Misener sandstone, where present. The pre-Woodford structural configuration of the study area was delineated by an isopachous map from the top of the Woodford Shale to the base of the Viola Limestone. The pre-Woodford structural map and the paleotopographic map were used to estimate the relation between them. Relationship of the areal extent of the Misener sandstone and the pre-Woodford unconformity was studied mainly by comparison of the isopachous maps. Modes of deposition of the Misener sandstone were inferred by use of isopachous maps mentioned above, well samples, well cores, electric logs, and thin-sections. Probable relationships of post-Misener structural geology and hydrocarbon accumulation were defined through use of a structural contour map of the top of the Woodford Shale.

Findings and Conclusions: The Misener sandstone generally occurs in topographic lows of the pre-Woodford terrain. Structural geology at the time of the pre-Woodford unconformity affected topography of the pre-Woodford terrain to some extent. The overall depositional environment of the Misener sandstone in the area of study probably was that of an alluvial system, in which sand was deposited on the pre-Woodford terrain in a dendritic pattern. Two major types of traps can be delineated from evidence available in the study area: (1) pinchouts on flanks or crests of anticlines and domes, and (2) structural closure of Misener sandstone where it is folded over anticlines and domes.

Permian Uranium-Bearing Sandstones on the Muenster-Waurika Arch and in the Red River Area

CHARLES MICHAEL MORRISON, Oklahoma State University, M.S. thesis, 1977

Scope and Method of Study: Surface and subsurface data were used to determine the relationship between surface radioactive anomalies and shallow structural features. Sedimentologic features and depositional environments were

determined primarily from outcrop data. The stratigraphic framework was derived from subsurface data. Peparation of eight correlation sections aided in determining stratigraphic markers used in preparation of one shallow structural map and three net sandstone percentage maps.

Findings and Conclusions: Permian channel sandstones in the study area are lenticular bodies which exhibit some multistoried and multilateral characteristics. Depositional environments ranged from either tidal-flat or lake mudflat to alluvial plain in most of the area. Post Oak sandstones in the northern part of the study area were deposited on the alluvial plain which extended south of the piedmont area adjoining the Wichita Uplift, a major source area. The Ouachita system was another major source area. Two converging alluvial plains reflected those provenances; the plain next to the Wichita Uplift was narrow, but a wide plain extended west and northwest of the Ouachita system. Uranium in non-arkosic sandstones is concentrated near faults and along anticlines. Uranium in sub-arkosic to arkosic sandstones from the Wichita source probably was concentrated by vertical movement of water, due to climatic variations, below permeability barriers.

Distribution, Depositional Environment, and Reservoir Properties of the Pennsylvanian Cottage Grove Sandstone, South Gage Field, Oklahoma

DANNY JOE TOWNS, Oklahoma State University, M.S. thesis, 1978

Scope and Method of Study: Structural framework, stratigraphic framework, geometry, and internal features of the Cottage Grove Sandstone were determined and compared to various depositional models in order to approximate sandstone distribution and depositional environment. Various correlation sections, structural maps, and isopach maps were prepared to determine geometry, structural framework, and stratigraphic framework. Internal features, including sedimentary structures, body and trace fossils, texture, and constituents were determined through detailed analyses of four cores. Reservoir properties, including delineation of fluids, were examined by comparing known production data with macro- and micro-features of the sandstone.

Findings and Conclusions: The Cottage Grove Sandstone in the South Gage Field formed as a shallow marine bar more than 20 miles offshore. The bar, which possibly formed as a tidal ridge, is convex-upward and has an elongate to elliptical shape. It is composed of very fine-grained sandstone, siltstone, silty shale, and carbonate units, which are enclosed in marine shale. Terrigenous clastics were transported from the east, and the dominant source area apparently was the Ouachita Uplift. Three major zones of sedimentary structures can be identified in the Cottage Grove Sandstone: a lower small-scale cross-stratified zone, an intensely burrowed zone, and an upper zone of siltstone-shale interstratification. Oil production apparently is confined to the zone of small-scale cross-stratification due to textural variations between the zones. Grain size, amount of clay, and distribution of carbonate-cemented layers, all of which affect reservoir quality by determining pore sizes, should be taken into consideration when developing the Cottage Grove Sandstone.

Some Aspects of the Petrology and Geochemistry of Selected Freshwater Carbonates

WILLIAM RICHARD TRENT, Oklahoma State University, M.S. thesis, 1978

Scope and Methods of Study: Petrography and geochemistry of hydrothermal "freshwater" carbonates from three locations in Colorado and one location in New Mexico are contrasted with an assortment of freshwater carbonates from localities in Oklahoma and the United Kingdom. Samples collected on outcrop and from one core were analyzed for the elements Ca, Mg, Fe, Mn, Sr, Ba, Na, K, Li, Zn, Pb, Cu, Cr, and Ni by means of atomic absorption spetrophotometry. Distribution of mol percent Mg within 30 selected specimens was studied using x-ray diffraction and results were compared to atomic percent Mg attained by atomic absorption analysis. Scanning electron microscopy was conducted to examine the variety of surface textures and to confirm mineralogy. Geochemical data were studied statistically to determine interrelationships among the elements present.

Findings and Conclusions: Terrace and mound-shaped calcium carbonate build-ups are surface expressions of hydrothermal deposition. The primary microscopic fabric of these deposits is an anhedral mosaic of equigranular micrite and microsparite. Partial infill of pores by various sparite textures is a secondary fabric. Pisolites and calcite-galena veins are associated minor features. Overall, the carbonates range from low-Mg to high-Mg calcite. Aragonite is present in two samples as euhedral pore-lining acicular crystals. Unusually high concentrations of Sr^{+2} are interpreted as replacement cations within the calcite. Geochemical analyses indicate that hydrothermal "freshwater" carbonates vary considerably in composition both from one locality to the next and within particular localities. Application of standard chemical principles is difficult owing to the incorporation of detrital materials during carbonate precipitation. In general, carbonate chemistry is influenced by the composition of the bedrock.

Uranium Potential in the Antlers Formation South of the Belton-Tishomingo Uplift, Southern Oklahoma

STEPHEN JOSEPH WHITE, Oklahoma State University, M.S. thesis, 1977

Scope and Method of Study: This study was designed to locate areas of uranium mineralization in the Antlers Formation using hydrogeochemical and radiometric methods. Ground-water samples were analyzed for Eh, pH, Ca, Mg, Na, K, Si, CO_3^{-2}, HCO_3^-, SO_4^{-2}, Cl^- and U. A carborne scintillometer survey was carried out to determine background radiation and locate possible anomalies. In addition, previously reported anomalies, anomalies located by an airborne radiometric survey, and asphalt deposits were investigated in detail for possible uranium enrichment. Petrographic and clay-mineralogy studies were made and analyzed in relation to the potential host rock.

Findings and Conclusions: No new anomalies or areas of uranium mineralization were found on outcrop. However, asphalt deposits in the uppermost

Antlers, just below the contact with the Goodland-Walnut Formation, suggest uranium mineralization in the subsurface, south of the asphalt deposits. It is unlikely that the asphalt was formed within the Antlers or migrated to its present position in the absence of a zone of secondary permeability connecting the Antlers with the Paleozoic rocks in the subcrop south of the Washita Valley fault-complex zone. It is proposed that a fault in this zone moved during the Cretaceous in response to the deposition of the Antlers sands and ceased movement after adjusting to the increased load. Petroleum seeping up through the Antlers would have created a reducing zone; any ground water moving downdip with dissolved uranyl ions would have precipitated tetravalent uranous minerals.

OGS Takes Part in COSUNA Project

COSUNA, an acronym for Correlation of Stratigraphic Units of North America, is an ambitious project whose ultimate goal is publication of stratigraphic correlation charts of North America and its continental margins. The factual material on COSUNA presented here comes from an informative summary prepared by Jules Braunstein.

Funded by the U.S. Geological Survey, the project has been contracted to The American Association of Petroleum Geologists, which, in turn, has subcontracted it to Texas Tech University. Orlo Childs of Texas Tech has been named project director, and he is guided by a steering committee, headed by Grant Steele, Gulf Oil Co., U.S.A., and by a technical stratigraphic committee, headed by Amos Salvador, Exxon Oil Co. Other organizations represented on the steering committee besides AAPG include the Association of American State Geologists, the U.S. Geological Survey, the American Association of Stratigraphic Palynologists, the American Commission on Stratigraphic Nomenclature, the Society of Economic Paleontologists and Mineralogists, The Geological Society of America, the Joides-Planning Committee, the Geological Association of Canada, and the Instituto de Geologia of Mexico.

The Oklahoma Geological Survey's direct involvement in COSUNA comes mainly through director Charles J. Mankin, who is one of 17 regional coordinators for the project in the conterminous United States. Charlie is responsible for the "Texas-Oklahoma Tectonic Region," which comprises the Marathon-Ouachita tectonic belt and the Arkoma Basin on the east including the Arkansas portions, the Chautauqua Platform in north-central and northeastern Oklahoma, the South Oklahoma folded belt, and, in Texas, the Fort Worth Syncline, the Bend Arch, the Strawn Basin, the Llano Uplift, and the Kerr Basin. These areas are based on the geologic provinces as used by the AAPG Committee on Statistics of Drilling.

Several other OGS geologists are involved in the Oklahoma portion of the COSUNA project. Robert O. Fay has been assigned the principal responsibility of defining and correlating stratigraphic units. Others taking part are associate director Kenneth S. Johnson, Thomas W. Amsden, S. A. Friedman, William

E. Harrison, and William D. Rose. Patrick K. Sutherland of The University of Oklahoma's School of Geology and Geophysics is also a participant.

Jules Braunstein explains that the correlation charts which will emerge from the COSUNA project will include subsurface as well as surface data and that the vertical columns will depict the stratigraphy from grass roots to as deep in the section as data are available instead of being oriented horizontally by systems. The framework for the correlations is a column of "global" chronostratigraphic units arranged by erathems, systems, series, and stages.

The project has been active for about 2 of the 6 years originally estimated as needed for data gathering. The first review of progress by the operating committees is planned for February 1979.

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Report Issued on Uranium Potential in Northeastern Oklahoma

A report entitled *Feasibility Study for Potential Drilling and Logging Sites in Northeastern Oklahoma* has been issued by the Grand Junction, Colorado, office of the U.S. Department of Energy. The report was issued as part of the National Uranium Resource Evaluation (NURE) program.

W. B. Creath, Laurel P. Upshaw, L. R. Reeder, and P. K. Link, Environmental Sciences Corp., Tulsa, prepared the report, which covers the results of a study on the uranium potential of northeastern Oklahoma.

Anomalously high radioactive values have been recorded on gamma-ray logs of oil wells. The study, which was undertaken to assess the distribution and meaning of these anomalies, covered about 13,000 square miles in 19 counties.

The 72-page report, GJBX-111(78), has been placed on open file at locations in 19 states, including the Oklahoma Geological Survey.

The report is available on microfiche for $3. Prepaid orders should be sent to Bendix Field Engineering Corp., Technical Library, P.O. Box 1569, Grand Junction, Colorado 81501. Checks or money orders should be made payable to Bendix Field Engineering Corp.

Oops—

After all copies of the August 1978 issue of *Oklahoma Geology Notes* had been mailed to our subscribers, we discovered that some of the copies were

defective, having pages either omitted or repeated. As these particular pages happened to be in the midst of our annual bibliography of Oklahoma geology, it was obvious that any omitted pages would render that portion of the bibliography useless.

At this point we weren't sure how many defective copies had been circulated. Then we began hearing from our subscribers, so we knew that some of you, at least, had received bad copies.

So, be sure to let us know if you did receive a defective copy. Drop us a card, give us a call—we'll be glad to send you a *good* copy in return.

And we're sorry for the inconvenience. After all, the batch of *Notes* we inspected looked good, so wasn't it okay to ship 'em out?

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